# The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XVII FEBRUARY, 1906 No. 2

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# THE NATIONAL GEOGRAPHIC MAGAZINE


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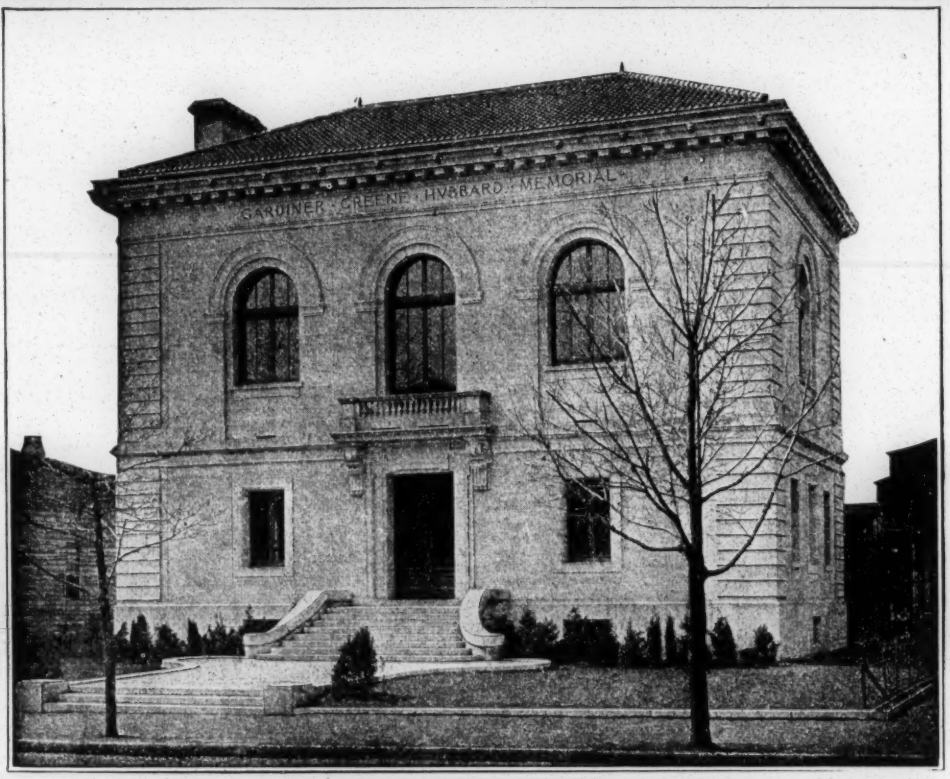


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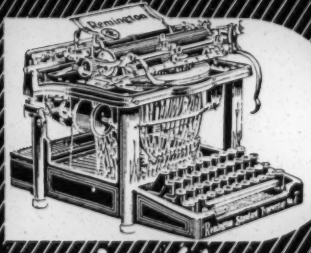


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VOL. XVII, NO. 2 WASHINGTON FEBRUARY, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

# THE PANAMA CANAL*

BY HON. THEODORE P. SHONTS

CHAIRMAN OF THE ISTHMIAN CANAL COMMISSION

*An article by Mr Shonts was published in the December, 1905, number of this Magazine, describing the sanitary revolution on the Isthmus and the enormous purchases of supplies, 61 steam shovels, etc. The present paper explains the experiments with foreign labor, the arrangements for equal transportation facilities, and other questions not previously described.*

IT is a pleasure to speak of the Panama Canal in the home of Secretary Taft, and to an assemblage of his neighbors and friends. He is a son of Cincinnati and of Ohio in whom the whole country takes pride, for his services on the bench, in the Philippines, and in the government at Washington have brought honor, not only to his native city and state, but to the American name before the world. I consider it a high privilege to be associated with him under the direction of President Roosevelt in the conduct of the most stupendous enterprise to which this nation has ever put its hand. He brings to this task the broad intellectual grasp, the calm, clear judgment, the complete patriotic devotion, and the inflexible, uncompromising, and outspoken honesty that are the distinguishing traits of his public career. The value to the country of the services of such a man in its government cannot be overestimated. When the canal shall have been completed—as completed it surely will be—no small share of the credit for the great achievement will be due to his wise counsel, inspiriting coöperation, and unflagging faith in the ability of the American people to solve any problem with which they are confronted.

I am here tonight to talk, as I have said, not of an experiment, but of an assured success. We are not merely going to build the Panama Canal—we are building it. Preparation is a part, and a most important part, of the work of construction. When that shall have been fully and thoroughly accomplished, a great step forward will have been taken. You cannot erect a house until you have laid the foundation. You cannot run a railway until you have laid the tracks. You cannot build a chimney by placing the top bricks first. These are trite tru-

* An address to the Commercial Club, Cincinnati, Ohio, January 20, 1906.

isms, but there seem to be people in this country to whom they are novelties. We are approaching the end of the preliminary work. We have made the Isthmus a healthful place in which to work. We are getting the line of the canal into a condition which will enable us to operate an excavating plant to the best advantage, and we are assembling the plant with which the work is to be done. When you bear in mind that we have been engaged in this preparatory task barely six months, that we have been compelled to carry it forward in a tropical country, mainly a wilderness, not accessible by railway, but 2,000 miles at sea and 2,000 miles from the base of supply, and that most of the material entering into the work had to be manufactured to order before it could be shipped to the scene of action, I think you will admit that the amount of time consumed has not been unreasonable.

I shall not burden you with details of the preparatory work. These were set forth by me in a speech before the American Hardware Manufacturers' Association, a few weeks ago,* and are to be found in the recent report of the Commission to Congress. Briefly summed up, they have resulted, first, in converting the Isthmus from a hot-bed of disease into as healthful a place for work of the kind in hand as could be found in any tropical country—with reasonable care a man can go there to live now with no more serious menace to his health than he would encounter in frontier work in our own country; second, the workers of all grades are provided with suitable and sanitary quarters, wholesome food in abundance and at reasonable prices, and pure water; third, an antiquated, inadequate, and poorly manned railway system has been improved and reorganized on modern lines, and provided with up-to-date equipment of locomotives and cars; fourth, new wharves equipped with modern mechanical appliances, commodious terminal yards at both ends of the railway, extensive warehouses, suitable machine shops, and a modern coal-hoisting plant are rapidly approaching completion; fifth, more than $9,000,000 has been expended in the purchase of supplies and material, largely for an operating plant in the actual work of excavation, and the bulk of this investment is already on the Isthmus.

* Published in the National Geographic Magazine, December, 1905.

### SUPPLIES WERE BOUGHT IN THE UNITED STATES

This vast quantity of supplies has been purchased almost exclusively in the United States. In accordance with our policy of buying in the cheapest markets, we have bought chiefly in the United States because its markets, in the main, are the cheapest in the world for the products that we need in this work. The American laborer is the highest priced in the world, but we can buy the results of his work more cheaply here than abroad, because of his superior skill and because of the intelligent interest which he as an American citizen takes in his work. In other words, he puts more brains into the product of his hands, because he is a citizen of a free country and his mind has been enlarged and his ambition stimulated by active participation in the duties of citizenship.

While buying our supplies in the United States we have seen to it that the entire country should be admitted on equal terms to the competition for furnishing them. Our theory is that since the American people are to defray the cost of building the canal, the whole American people should be treated alike in the opportunity to derive legitimate industrial and commercial profit from the outlay for construction. One of the first acts of the present Commission after taking office was the adoption of a policy designed to place all manufacturers and producers in all parts of the country on equal terms in regard to shipments of

goods to the Isthmus. The chief features of this policy were:

TRANSPORTATION MONOPOLIES TO THE ISTHMUS HAVE BEEN ABOLISHED

(1.) We threw open all terminal facilities on the Isthmus to all steamship lines on equal terms. Prior to this time the Panama Railroad, being a private and not a government corporation, had endeavored to force the shipment of all canal supplies by way of New York. The management of the railroad required that steamship lines from Gulf ports should charge the same rates from their ports to Colon as were charged by the railroad's steamship line from New York to Colon, under penalty of being deprived of the railroad's dock facilities at its terminals.

The result of this was to give great advantage to the port having the shortest rail line from point of production. As New York was much nearer the centers of production than Gulf or Pacific coast ports, it secured the bulk of the business. When the government assumed control, by purchase, of the Panama Railroad, one of the Commission's first acts was to notify all steamship lines that they could have the use of the railroad's terminal facilities on the Isthmus on the same terms as the steamships of the railroad company, without regard to any rates they might make from their ports of departure.

(2.) We required all bids for supplies to be made c. i. f. the Isthmus—that is, all bids to include cost of delivery on the Isthmus.

(3.) In order to prevent any charge of discrimination in rates, as between New York and the Gulf and Pacific coast ports, we separated the Panama Railroad Steamship Line from the Panama Railroad and threw open the use of that steamship line to all railway connections at New York on agreed percentage divisions. We gave our direct rail connections at New York, as well as all others, the privilege to make rates from all producing territory clear through to Colon. Under this policy the manufacturer situated on the line of a railroad leading to New York has no advantage whatever over the one situated on lines of railway running to Gulf ports. Each can arrange for his own rates straight through to Colon. We went a step further and adopted the policy of charging the government on the Commission's shipments from New York exactly the same rates that are paid by any other shippers from that port locally. Our object in these various acts was to protect the United States government from any charge of favoritism to any section of the country or to any port.

If we had made low rates from New York on our own materials it would have been charged that these were less than private capital could afford to grant, and that therefore the government should install similar service from the South Atlantic and Gulf ports. We should also have been charged with rebating to ourselves as against other shippers, thus violating the law. What we did was to put the government on a parity with every other shipper, and all sections of the country on exactly the same footing. If by reason of these policies competition among the railways in different sections of the country shall result in rates below a profitable basis, the government will be the gainer, because it will get the benefit of a reduced cost in the price of its material delivered on the Isthmus. In no case can the government be a party to any kind of discrimination.

You, gentlemen, being situated about equally distant from the Gulf and the seaport, are especially favored under this policy. You will get the benefit of the competition of the railways leading through both gateways, and should be able to secure very reasonable rates of transportation on any goods you may produce and desire to sell which enter into the construction of the canal.

LABOR IS THE DETERMINING FACTOR

I come now to a branch of this subject to which I have referred in my address before the Manufacturers' Association, and also in the Commission's report to Congress, and I bring it up again because there is nothing connected with the construction of the canal that surpasses it in importance in its bearing on results. I refer to the labor question.

The character of labor employed on the Isthmus has more to do with the time it will take to build the canal—more to do with the cost of construction—than any other determining factor.

There is no insuperable difficulty in the way of the construction of the canal from an engineering point of view and with any ordinary class of labor. The serious problem is to get what will be considered in this country anything like an ordinary class of labor. In examining this question we have studied and discussed the merits of labor of nearly all nationalities available for the purpose. The chief difficulty with which we have to contend in the employment of oriental labor, lies in the laws which hedge about its use. In order to comply with the letter and spirit of these laws, the best that we can do is to let out the work by contract, advertise and secure the lowest bidder, who will be nothing more or less than an agent. He will secure the labor, deposit the money required by the government of the country from which the laborer comes for the sustenance necessary to the support of his family while he is away, and advance the money for the necessary transportation. All this is to be included in the cost of the labor delivered on the Isthmus, in addition to the agent's remuneration, making it very high-priced. The government must protect itself against the charge of forcing involuntary servitude, and hence it can adopt no safeguards which will prevent the labor from leaving the Isthmus the day after arrival, thus losing the money necessary to get it there, with no return whatever. The result of this is practically to make oriental labor prohibitive in the construction of the canal.

EXPERIMENTS WITH ITALIANS, SPANIARDS, AND WEST INDIANS

Experiment with Italian laborers, while not made on a large scale, has not been satisfactory, for the reason that they do not seem possessed of great vitality and succumb quickly to tropical fevers.

The West Indian negro that we are using has but little life and ambition in him. We are practically trying to wield an inert mass, with the result that we are not getting over 25 per cent or, from a most liberal point of view, 33⅓ per cent of the efficiency of the most ordinary labor in the United States. We are now arranging to experiment with 1,000 laborers from the north of Spain. This class of labor was used to great advantage by Sir William Van Horn in the construction of his 350 miles of railroad in Cuba. While not tall, they are of muscular build, docile in temperament, and willing and industrious workers, with enough ambition to want to become subforemen and foremen in their work. In other words, besides being laborers they have a spark of ambition which makes it possible to develop them into something better than brute force. These men have the further advantage of being white, and of speaking the language which most of our foremen either know or rapidly acquire after reaching the Isthmus.

So far as the labor in the United States is concerned, we might as well recognize the facts. The best quality of this labor is regularly employed, because of the great industrial activity here. This confines our selection to those employed only as extra men and those seeking employment, who of course will not grade as high as those regularly employed. In order to get these men in some branches of trade, it is necessary to pay larger wages than are paid in this country, for

they would rather have extra work, with a chance of regular employment here, than leave their own country.

### THE EIGHT HOUR LAW WOULD BE AN EXTRAVAGANCE

Before closing my remarks in regard to the importance of labor in this enterprise, I wish to repeat and to emphasize the opinion I have expressed on former occasions in regard to the application of the eight-hour law. The present wage varies from 80 cents to $1.04 per day in gold. As compared with the best common labor in the United States, its efficiency is rated at from 25 to 33 per cent. Over 80 per cent of the employees of the canal are now and will continue to be alien laborers. A majority of the other 20 per cent employed will be in a clerical, a supervisory, or in some other capacity to which the various labor laws of the United States are not applicable. It is to this kind of labor we are compelled to apply the eight-hour law—that is, to aliens who know nothing of the law's existence until they arrive on the Isthmus.

Such application will increase the labor cost of canal construction at least 25 per cent. You can readily see why this will be the case. We pay our laborers by the hour. If we can employ them for only eight hours a day we can give them work for only forty-eight hours a week. If we can employ them for ten hours a day we can give them sixty hours a week. They will accept a smaller hourly wage for sixty hours a week than they will for forty-eight hours. As a matter of fact, the skilled laborers prefer a ten-hour day, and many of them have asked for it, desiring to get the extra two hours' pay. When they work overtime on the eight-hour plan they expect to get time and a half.

It is obvious that by forcing the eight-hour day upon us, millions of dollars will be added to the cost of construction. American labor in this country will have to pay its share in the consequent increase of taxation, and for no appreciable benefit, for, as I have shown you, there are only a very few American laborers on the Isthmus. There is no question of American labor involved in Isthmus work, and I repeat what the Commission has urged in its annual report, that it is a mistake to handicap the construction of the Panama Canal with any laws save those of police and sanitation, and that labor on the Isthmus should be excluded from the application of the eight-hour law, the contract-labor law, the Chinese exclusion act, and any other law passed or to be passed by Congress for the benefit of American labor at home.

As I said at the beginning of these remarks, our preparatory work is nearing completion. It has, in fact, advanced as far as we can carry it safely until we know definitely the type of canal we are to construct, whether it is to be sea level or high level. It is of the utmost importance, therefore, that decision as to this type be reached at the earliest possible moment. I had hoped when I accepted your invitation that before the time to address you should arrive the Advisory Board would have made its report, and I should be at liberty to speak freely about it, and to discuss both the details of the plan decided upon and the methods to be employed in its execution. The members of the Board consumed much more time in their deliberations than they had anticipated, and as the two reports which they have decided to make are not yet before the Commission, it would be obviously improper for me to enter upon the subject now.

### THE DIGGING WILL PROBABLY BE DONE BY CONTRACT

I am glad to say, however, that whatever may be the type decided upon it will take us but a short time to complete the arrangements for beginning at once to carry its details into execution on a com-

prehensive scale. We shall divide the work into sections and prepare specifications asking for bids for contracts for such portions of the work as we think can be done advantageously in that way. We are strongly in favor of doing the work by contract if the type of canal and the prices bid will permit. One of the chief benefits we have derived from the preparatory work is the accumulation of knowledge as to the nature of material to be handled and the cost of handling it, which will enable us to judge whether or not such bids as we may receive will make it desirable to have the work done by contract.

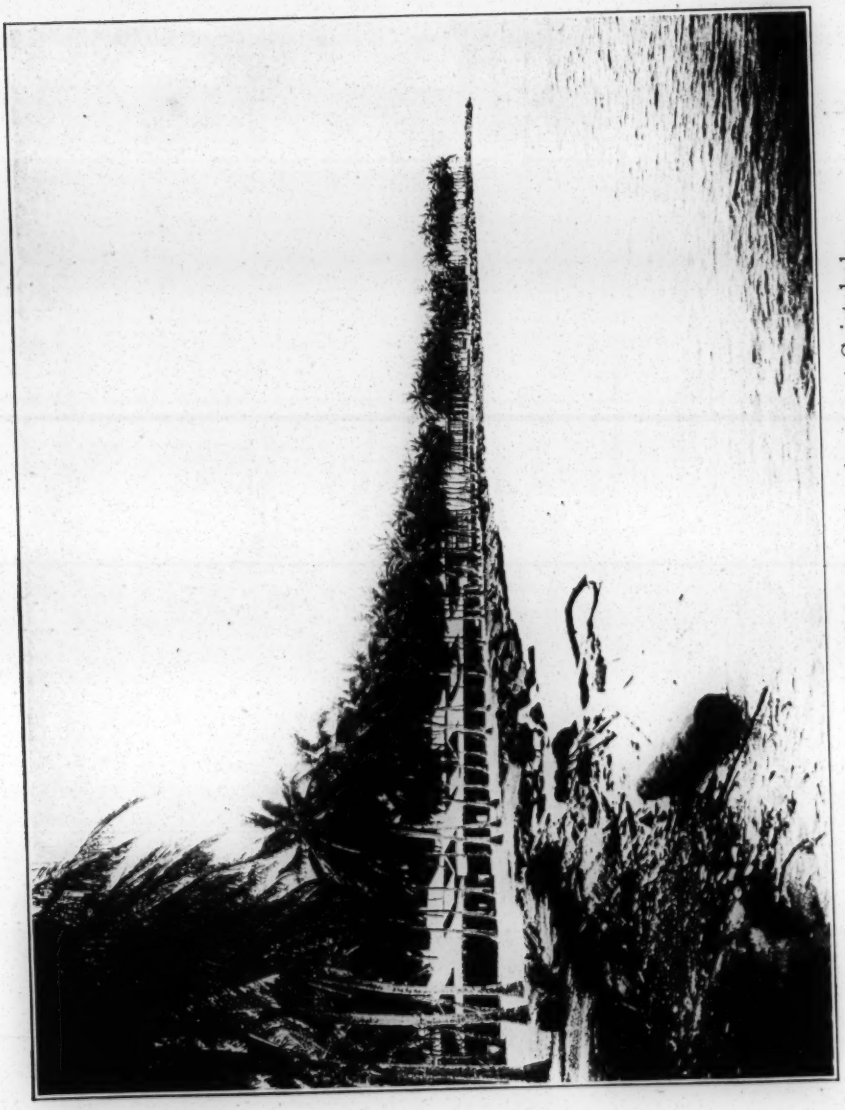
Gentlemen, we are treating this task as a great business enterprise and are seeking to accomplish it by the application of strict business methods, paying no heed to politics or political "pulls." Our sole aim and purpose is to give the American people the full worth of every dollar they put into the work, and to hand over the work completed to them at the earliest possible day. So long as we continue in control of the job it will be managed on these principles and on these alone. When it becomes apparent that we will not be permitted to build the canal in that way we will step aside and let somebody else take it in hand. In a recent message to Congress, President Roosevelt, who is the supreme director of the work, every step of which has been taken with his personal knowledge and with his approval, said:

"All our citizens have a right to congratulate themselves upon the high standard of efficiency and integrity which has been hitherto maintained by the representatives of the government in doing this great work. If this high standard of efficiency and integrity can be maintained in the future at the same level which it has now reached, the construction of the Panama Canal will be one of the features to which the people of this Republic will look back with the highest pride."

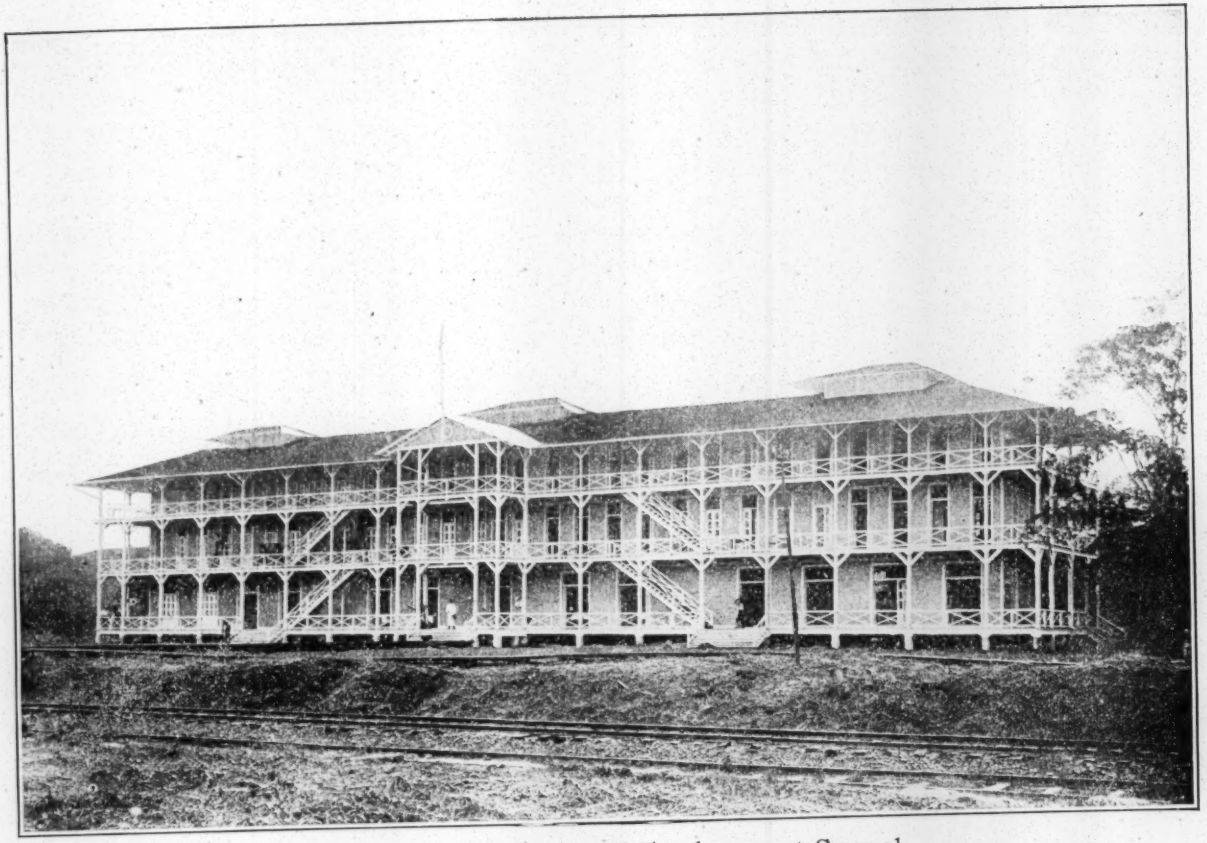
The members of the Commission and those associated with them in the task ask no higher approval than that; neither do they think that any other is necessary to carry conviction to the minds of the American people. In the same message the President also said:

"From time to time various publications have been made, and from time to time in the future various similar publications doubtless will be made, purporting to give an account of jobbery, or immorality, or inefficiency, or misery, as obtaining on the Isthmus. I have carefully examined into each of these accusations which seemed worthy of attention. In every instance the accusations have proved to be without foundation in any shape or form. They spring from several sources. Sometimes they take the shape of statements by irresponsible investigators of a sensational habit of mind, incapable of observing or repeating with accuracy what they see, and desirous of obtaining notoriety by widespread slander. More often they originate with, or are given currency by, individuals with a personal grievance. The sensation mongers, both those who stay at home and those who visit the Isthmus, may ground their accusations on false statements by some engineer, who, having applied for service on the Commission and been refused such service, now endeavors to discredit his successful competitors; or by some lessee or owner of real estate who has sought action, or inaction, by the Commission to increase the value of his lots, and is bitter because the Commission cannot be used for such purposes; or on the tales of disappointed bidders for contracts; or of officeholders who have proved incompetent or have been suspected of corruption and dismissed, or who have been overcome by panic and have fled from the Isthmus.

"Every specific charge relating to jobbery, to immorality, or to inefficiency, from whatever source it has come, has been immediately investigated, and in

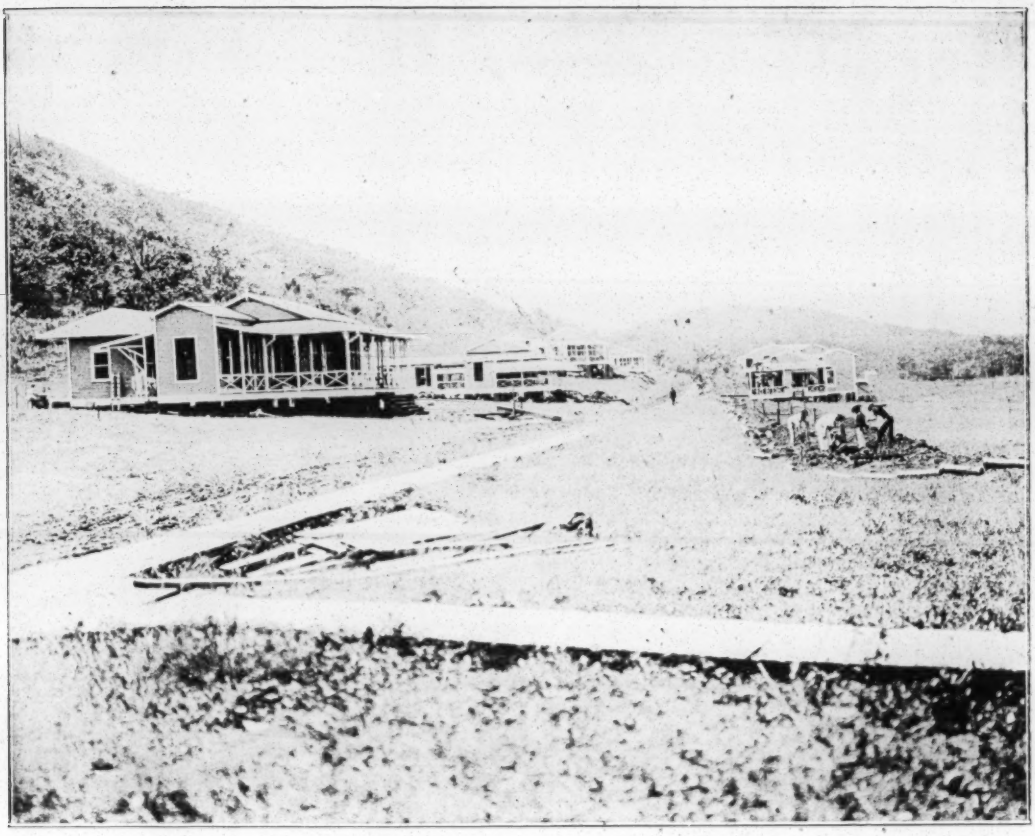


Cottages Built for Married Employees at Cristobal



A Typical Hotel for Canal Employees, at Corozal

This is the hotel that was reported by a certain traveler as "built in a swamp"



Cottages for Married Employees, at Corozal

no single instance have the statements of these sensation mongers and the interested complainants behind them proved true. The only discredit inhering in these false accusations is to those who originate and give them currency, and who, to the extent of their abilities, thereby hamper and obstruct the completion of the great work in which both the honor and the interest of America are so deeply involved. It matters not whether those guilty of these false accusations utter them in mere wanton recklessness or folly or in spirit of sinister malice to gratify some personal or political grudge."

Thus speaks the President.

A notable specimen of this scandal-mongering literature was laid before the country a few days ago from the pen of a man who had spent twenty-eight hours and ten minutes on the Isthmus. The ten minutes are important, for a person of such extraordinary powers of observation and production can collect an enormous amount of material in that time. He landed at Colon on November 30 at 10 a. m. and sailed away on the same steamer from Colon at 2.10 p. m. on December 1. In those twenty-eight hours and ten minutes he accumulated a fund of exact knowledge sufficient to enable him to draw a general and sweeping indictment of the President, Secre-

tary Taft, the Canal Commission, Governor Magoon, Chief Engineer Stevens, Colonel Gorgas, and everything that has been done on the Isthmus since the American government came into possession of the Canal Zone.

A MISSTATEMENT

He has been not merely answered but annihilated by Secretary Taft and Mr Stevens, and I shall waste no time with him. One point only will I mention as an illustration of his miraculous powers of observation. He said that during a recent rain the volume of water was so great in the sewers of Panama that it "backed the sewage up into cellars and ruined many houses." There is not a cellar in Panama and never has been.

THE TESTIMONY OF AN AMERICAN BUSINESS MAN WHO HAS LIVED 16 YEARS IN PANAMA

A few days after this masterpiece of mendacity appeared in print I took up the Washington *Post,* a newspaper which is not open to the charge of extreme partisan support of the Canal Commission, and read therein the following interesting statement:

"Mr John N. Popham, a former Virginian, who has many friends in Washington, was seen yesterday at the Shoreham. For the past sixteen years Mr Popham has been engaged in railway building and mining manganese on the Isthmus of Panama and in Costa Rica. He was for five years special agent of the United States Treasury on the Isthmus, and no man is better qualified to speak of the conditions existing in that country. In conversation with a *Post* reporter Mr Popham said:

"'Prior to last May the conditions on the Isthmus may have been open to just and intelligent criticism, caused by the delay in improving the physical condition of the Panama Railroad, purchase of necessary rolling stock, and improving the terminal facilities. But those conditions are forgotten history. The fair-minded residents of the Isthmus appreciate the magnificent efforts and splendid results accomplished since that time.'

"The statement made by Mr Poultney Bigelow is so far from being fair, the views so distorted, and the inference so frail, that it is only laughed at on the Isthmus, and it was so fully covered at home by that part of the President's communication to Congress the 8th instant, under the heading of 'Scandalmongers,' that there is but little left for a self-respecting American resident of the Isthmus to add. The people of Panama are intelligent, capable people. They appreciate the results accomplished; they have been and are anxious and willing to continue to help our people in the great enterprise that means so much to the whole world.

"After sixteen years' experience on and in the vicinity of the Isthmus, and knowing, as I do, the homes of the West India laborer in the great banana-producing districts near Colon, Bocas del Toro, and Port Limon, and having for many years employed from 400 to 700 Jamaicans daily at our mines, 35 miles from Colon, I feel competent to judge and to tell you that the West India laborer has never known, and in his most pleasant dreams has never hoped for, the splendid care and liberal treatment he is receiving from our government on the Isthmus of Panama.

"My knowledge of the affairs of the canal company only enables me to speak of conditions on the Isthmus and the work in progress there. But in every department of the canal work during the past seven months on the Isthmus the people of this country can rest assured that the investigation to be made by the Senate committee will confirm the following lines found in the President's communication to Congress: 'The work on the Isthmus is being admirably done, and great progress has been made.'"

That, gentlemen, is the testimony, vol-

untarily offered, of a man who can truthfully be called an expert. He has not merely made a twenty-eight hour visit to the Isthmus, but has lived there or in its vicinity for sixteen years. He is a man of unquestioned character, who has represented his government honorably there as its financial agent, and who has had practical experience in railway building and mining. The testimony of such a man should be final against the inventions and slanders not only of one, but of any number of scandal-mongers.

Speaking for the members of the Commission as well as for myself, I wish to say with all possible emphasis that we not only invite investigation of our acts but ask for it as a right. If we are doing our work honestly and efficiently, our hands should be upheld; if it is shown that we are doing it inefficiently, we should be removed; and if we are doing it dishonestly, we should be exposed, convicted, and sent to prison. Neither knaves nor incompetents should be permitted to have charge of a task of such magnitude. But while we court the fullest investigation, we earnestly ask that it be absolutely non-partisan, that it be made by persons of character and standing, either in public or private life, whose recognized intelligence and fair-mindedness are such as to command public confidence, and that it be made upon the ground.

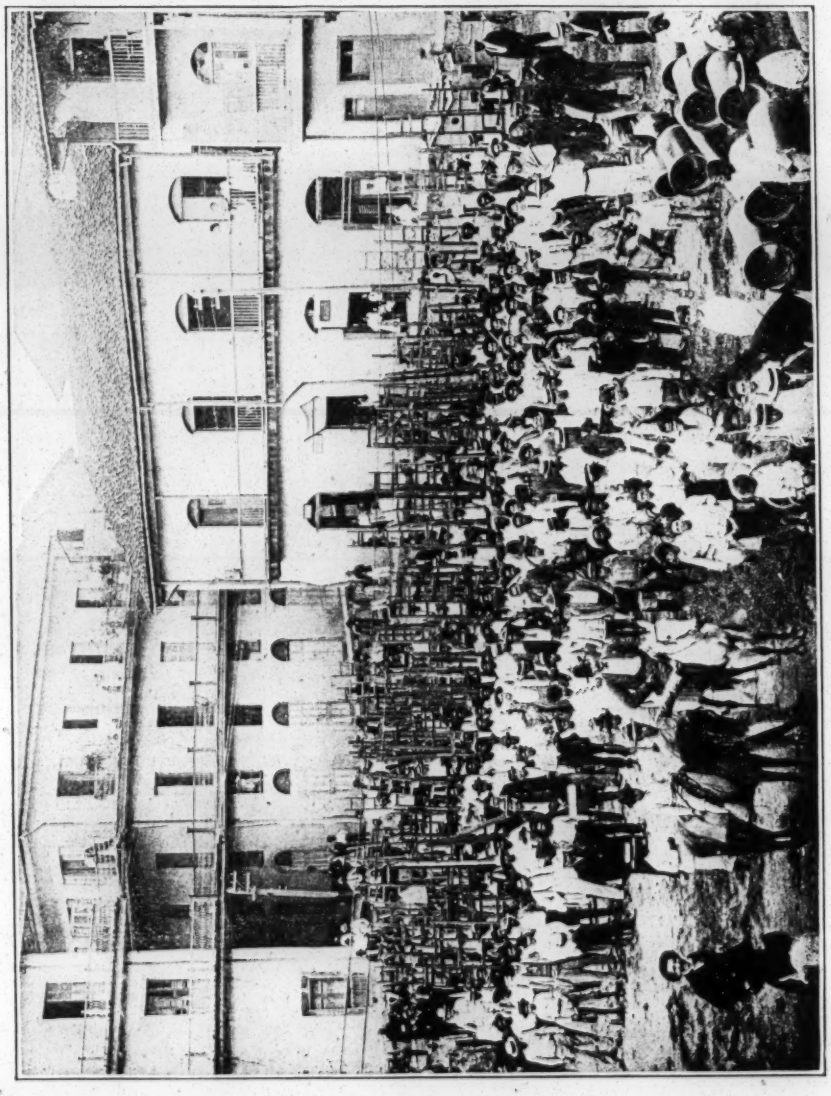
We ask further that the investigation be made promptly and ended as soon as it can be and have its work done thoroughly. This is absolutely necessary if we are to maintain any degree of efficiency in the organization. The feeling of uncertainty and unrest which constant agitation about the Commission and its work creates is destructive of that interest in the work which is essential if the best results are to be secured. It is impossible to retain good men in the service under such conditions.

We protest in the name of American fair play against the dissemination in the United States of libels and slanders upon the efficiency and character of faithful workers on the Isthmus who, by reason of their absence from their own country, cannot defend themselves from such assaults. Many of them went to the Isthmus before it was made a healthful place in which to work, and in doing so faced death from disease as the soldier faces it from the bullet on the field of battle. They saw many of their comrades die from disease, but they themselves either escaped it entirely or recovered from its attack. A more loyal, faithful, efficient body of men than these servants of the United States on the Isthmus is not to be found anywhere on earth. Their devotion to the interests of their country entitles them to the gratitude of their fellow-citizens, and should protect them from the cowardly attacks of that most despicable of all assailants, the man who stabs in the back.

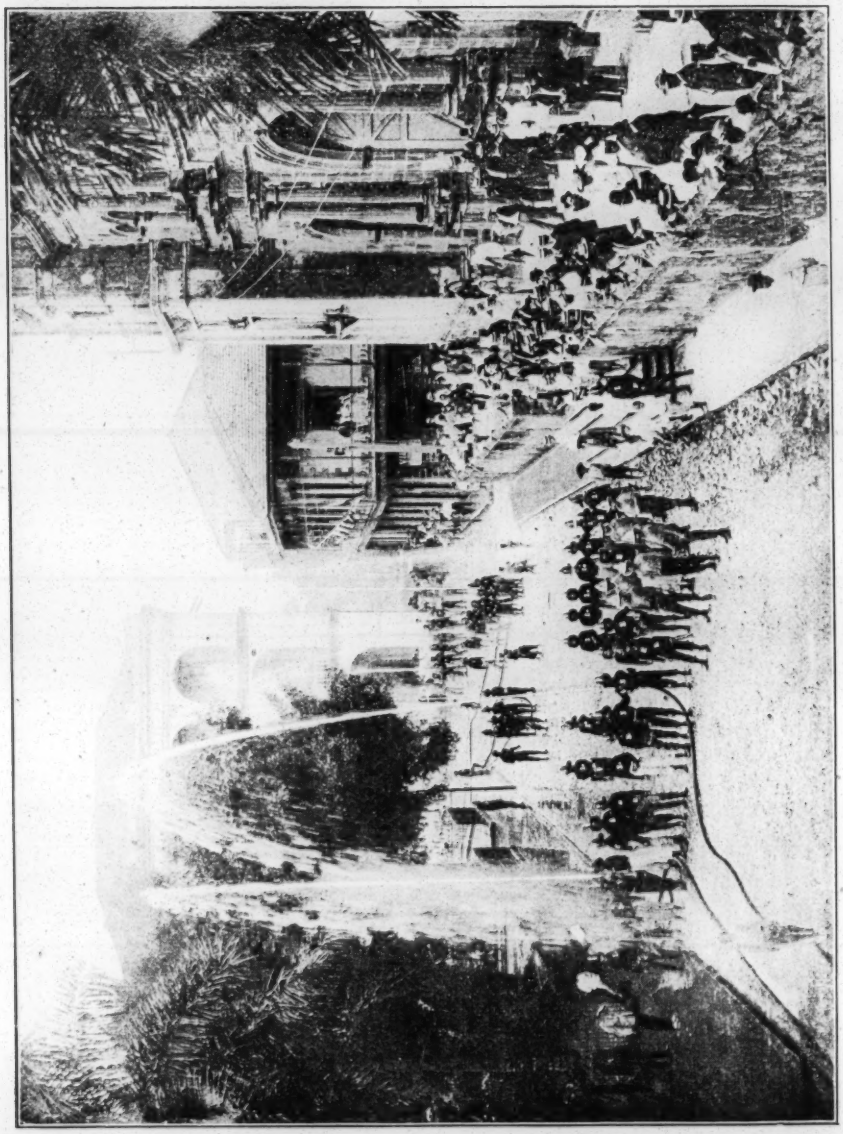
Gentlemen, I believe in the canal; believe that it can be built in a reasonable time, and believe that when, through American generosity and under American control, it shall be thrown open to the commerce of the world it will be hailed, and will prove to be, a priceless boon to all mankind. It will justify the faith of the American people in its wisdom and world-wide beneficence, and will justify also the expenditure of millions of American money for its construction. When it shall be opened for traffic the position of this nation in relation to the trade and commerce of the world will be a most favorable one.

### THE PROFIT FROM THE CANAL

We shall have a virtually continuous coast line from the northeastern extremity of Maine to the western extremity of Alaska, open alike to the ships of the Atlantic and the Pacific, and giving to both the opportunity to trade directly with each other. San Francisco will be within 14 days of New York by steamers making 16 knots an hour, instead of 60



Fumigating Force, Panama



Opening of Panama Waterworks System July 4, 1905. In Front of Cathedral

days, and within 21 days of any English port, instead of 35.

The west coast of South America will be 3,000 miles nearer to our ports than to those of Europe, opening to our products an entirely new field of commerce which has in it great possibilities. These are the broad, general facts in the case, and I need not explain to you that they have in them opportunities which are of incalculable value. They open to the United States new markets for its products, new opportunities for that enlargement of foreign trade which our rapidly growing production is demanding year by year.

In this enlargement of industrial and commercial activity the whole nation will share. All railway lines, including the transcontinental, will be benefited by the increased traffic which will surely follow. New steamship lines will be opened to accommodate the new trade between the two Americas, and the expanded trade with Australia and the Orient. The world's traffic will be changed to new currents, and in the change all the nations of the earth will profit.

The population of the world one hundred years ago was estimated at 800,000,000; today it is estimated at 1,600,000,000. In other words, the growth of the world's population during the past century has been equal to its accumulated growth during the previous ten thousand years. If this ratio of increase shall be continuous, the new population of the globe will find its home, not in the densely populated districts of Europe, but in the sparsely settled countries of North and South America. The development of these countries and of their trade with the Orient, as well as with Europe, will all pay tribute to the Panama Canal, for it will be in the heart of this new growth and the pathway of its commerce.

But great and world-wide as will be the material benefits of the canal, the moral and political effects will be no less remarkable and no less salutary. In the United States the inevitable effect will be to develop a stronger and deeper sentiment of national unity than this country has ever known. New and larger trade relations will join the Atlantic seaboard and the Pacific coast more closely than even the transcontinental railways have accomplished, and will tend to unify in interest and sentiment all the Americas.

With the canal open, there will be no Atlantic and no Pacific fleet, either in the navy or in the merchant marine, but an American fleet. As an object lesson in the need of an isthmian waterway, the trip of the *Oregon* in the spring of 1898 from San Francisco to the coast of Florida was the most convincing argument ever adduced. With her powerful machinery working to its utmost limit and everything in her favor, including a commander of the first rank, 68 days were consumed in the voyage. With the canal open, she could have made the trip in ten or twelve days and without need of special haste. Instead of two navies, we shall have a double navy ready for all emergencies. The ability to assemble our warships quickly will act as a powerful influence in the direction of peace, for it will operate constantly as a preventive of war. The high position as a world power to which this nation, under the guidance of McKinley and Roosevelt and Hay, has advanced during the past few years will thus be strengthened and enlarged, and American influence upon the civilization of the world and upon the welfare of the human race will be immeasurably extended.

XUM

# TRANSPORTATION METHODS IN ALASKA*

By Captain George S. Gibbs

Signal Corps, U. S. Army

IMAGINE, if you can, a country which has none of the hundreds of necessities of existence at hand and few of the thousands of accessories to industry—a country having a valuable output of products, almost all of which are useless to that country and are of value only when carried to far-distant lands.

Such is Alaska — dependent upon transportation for its very existence as a habitation and equally dependent upon transportation to give value to its ores and its furs. Two expressions, heard every day from Skaguay to Nome, tell just how the Alaskan pioneer feels about his position in this regard when he refers to Alaska as "on the inside" and the rest of the world as "on the outside." The implied barrier is significant, and it exists in fact, just as though the country were surrounded by a great wall, impassable for eight months in the year and none too easily scaled during the remaining short period.

Of course the ports of Juneau, Skaguay, and Valdes, and others on the southeastern coast, are open the year round, but neither freight nor passengers are carried to or from the interior of Alaska during the long winter season. A small amount of United States mail matter is carried in and out regularly by means of dog teams in relays, and each year a few adventurous and hardy travelers beat the season a few weeks by making the overland trip on foot and with dog team, either via Skaguay or Valdes.

So great is the transformation from an ice-bound, snow-covered, wind-swept wilderness to a land covered with luxurious vegetation and traversed by streams of navigable waters that the two seasons, summer and winter, suggest a convenient division of the methods of transportation.

Railroads, in the few places where short sections have been built, are in operation the year round, but with one exception they serve only local interests. Two short lines on the Seward Peninsula run from Nome and Solomon, on the

"Foxy"

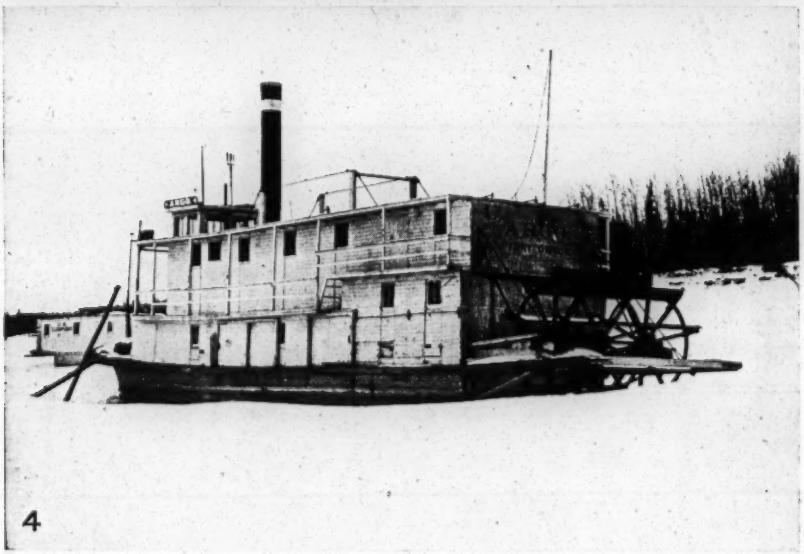
One of the dogs belonging to the repair team at the U. S. Military Telegraph Station at Chena, on the Tanana River, Alaska

* The photographs were taken by the author.

1. Horse Sleds delivering Supplies along the Trail between Valdes and Copper River during the Construction of the U. S. Military Telegraph Line

3. Soldiers of the U. S. Army dragging a Sled up an Incline through Soft Snow where it was Impossible for a Horse to Travel

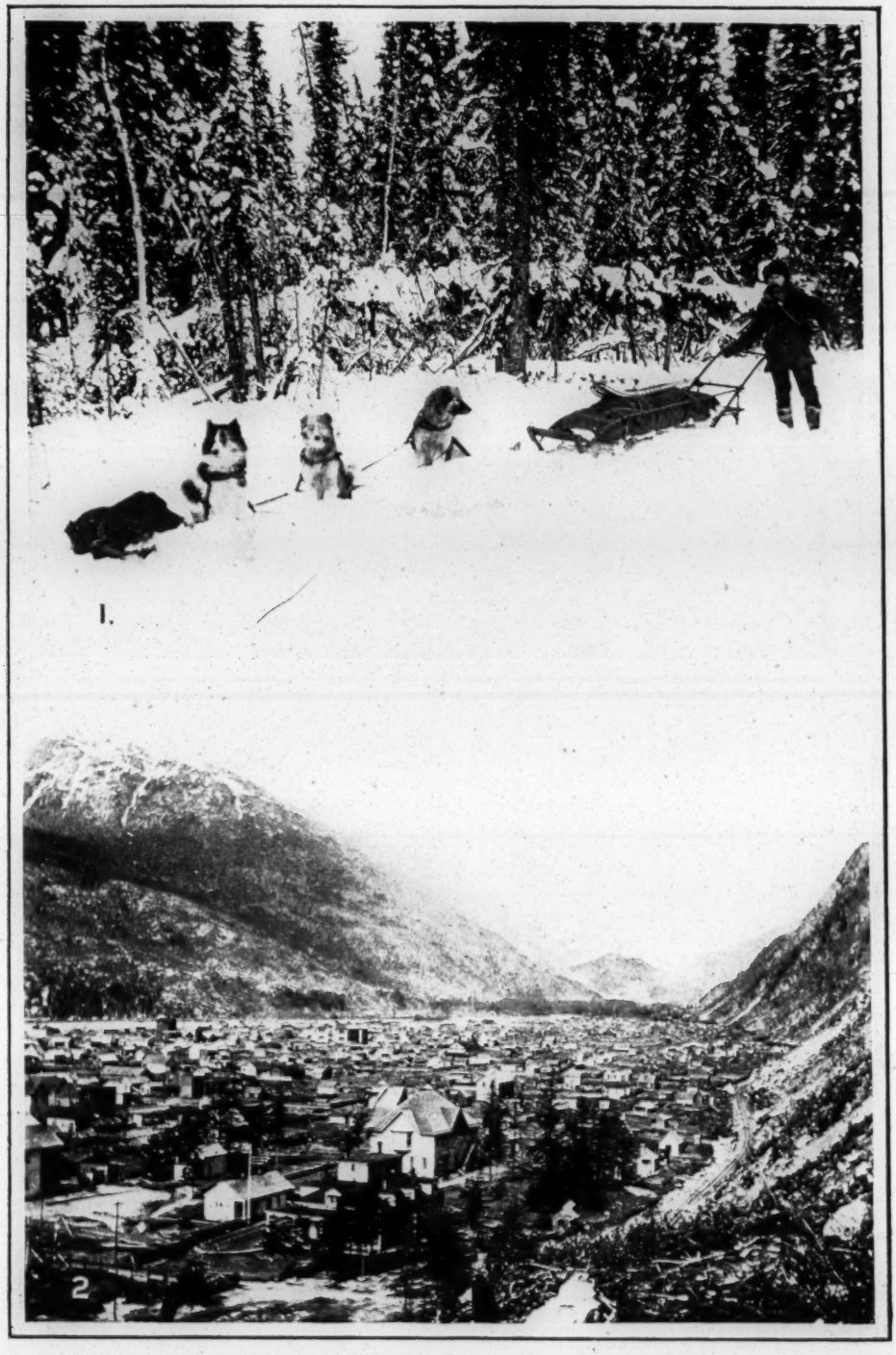
coast of Bering Sea, to centers of mining camps a few miles inland. Another short line connects Chena and Fairbanks, on the Tanana River, with the placer claims fifteen miles away. Two projected lines, starting from Seward, on Resurrection



2. Horse Sleds Returning to a Cache of Telegraph Supplies for Another Load

4. The U. S. Army Steamboat laid up for the Winter on a Sandbar in the Tozi River, Ten Miles below Fort Gibbon

Bay, and from Valdes, have the more ambitious object of connecting the Pacific coast with the Yukon; but the only railroad which is at this time a factor in reaching Alaska with supplies is the line, but little over 100 miles long, which




1. Signal Corps Repair Men from United States Telegraph Office, with Dog Team, out on Repair Trip. This picture shows well the dense growth that had to be cut along the Yukon and Tanana Rivers in order to build the telegraph line

2. Skaguay; Seaport Town of Southeastern Alaska. In the right of the picture will be seen the terminus of the White Pass and Yukon Railroad. In the upper left-hand corner is the "A. B." Mountain

1.

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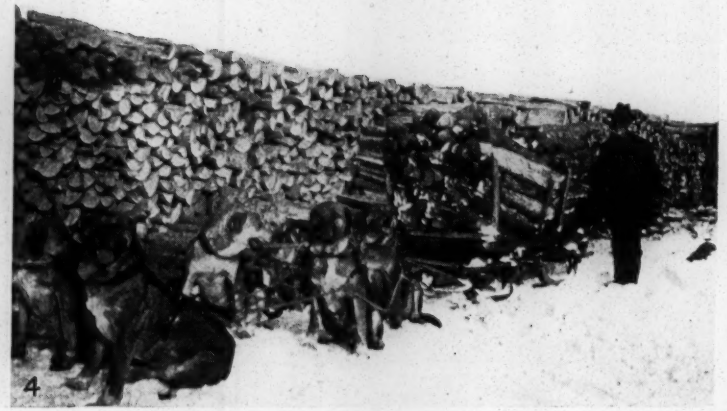
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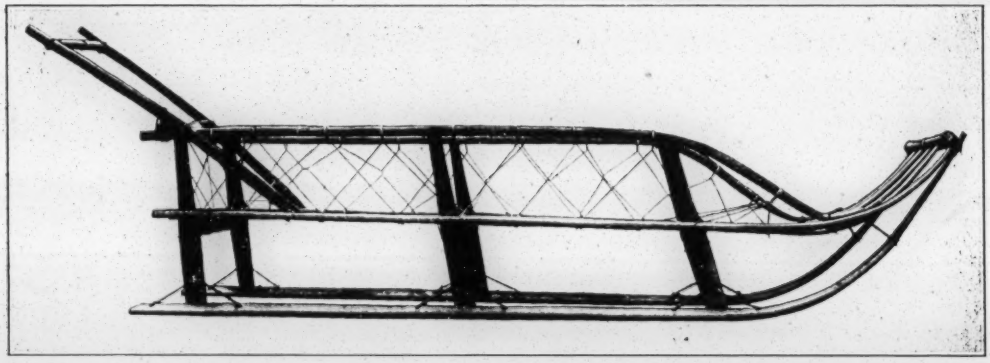
1. Signal Corps Dog-team about to start from Fort Gibbon on a repair trip along the Telegraph Line. The sled, besides being loaded with wire and tools, carries a stove, tent, bedding, and food for men and dogs, making them independent for several days
2. A Typical Picture of an Alaskan Prospector with his Dog-team following up a Small Stream on a Stampede to New "Diggings." The man himself is hitched to the load and the use of the "gee-pole" is clearly shown
3. Indians Traveling by Dog-team on Yukon River. Note the squaw is running ahead breaking trail, while the man is riding on the sled
4. A Phenomenal Dog-team, composed of six mastiffs, hauling three-fourths of a cord of wood a load



Indian Basket Sled of Central Alaska, made of Spruce and Birch and Moose Sinew, with no Metal Whatever

connects Skaguay, on the coast, with the head of navigation of the Yukon at White Horse. As this latter point is in Canadian territory and about 600 miles from the Alaskan boundary, this line is largely useful, so far as Alaska is concerned, only during the few weeks when the river steamboats can receive the traffic and carry it to its destinations.

The use of wheeled vehicles in Alaska need scarcely be considered, as there are no roads connecting camps or towns, and wagons are used only on the streets of a few of the larger settlements, principally between dock and warehouse. The present Alaska Road Commission is doing effective work in laying out and constructing highways, but those highways for years yet to come must be mostly of the primitive kind, fit only for single-horse sleds and dog teams in winter and for pack animals in summer.

The means of transportation remaining, then, are:

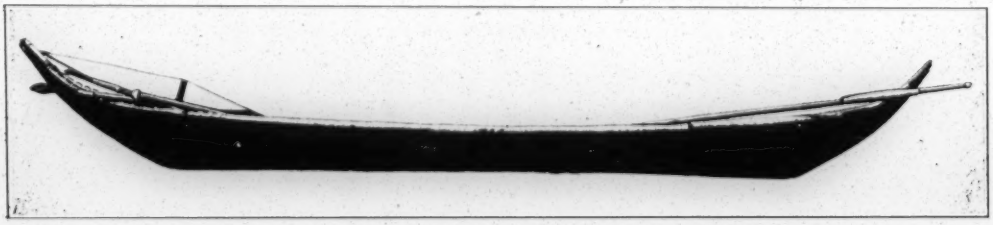
In summer—

1. River steamboats.
2. Tugboats (between nearby coast points).
3. Pack animals.
4. Poleboats and canoes.
5. Flatboats and rafts.
6. Packs carried by white men and natives.

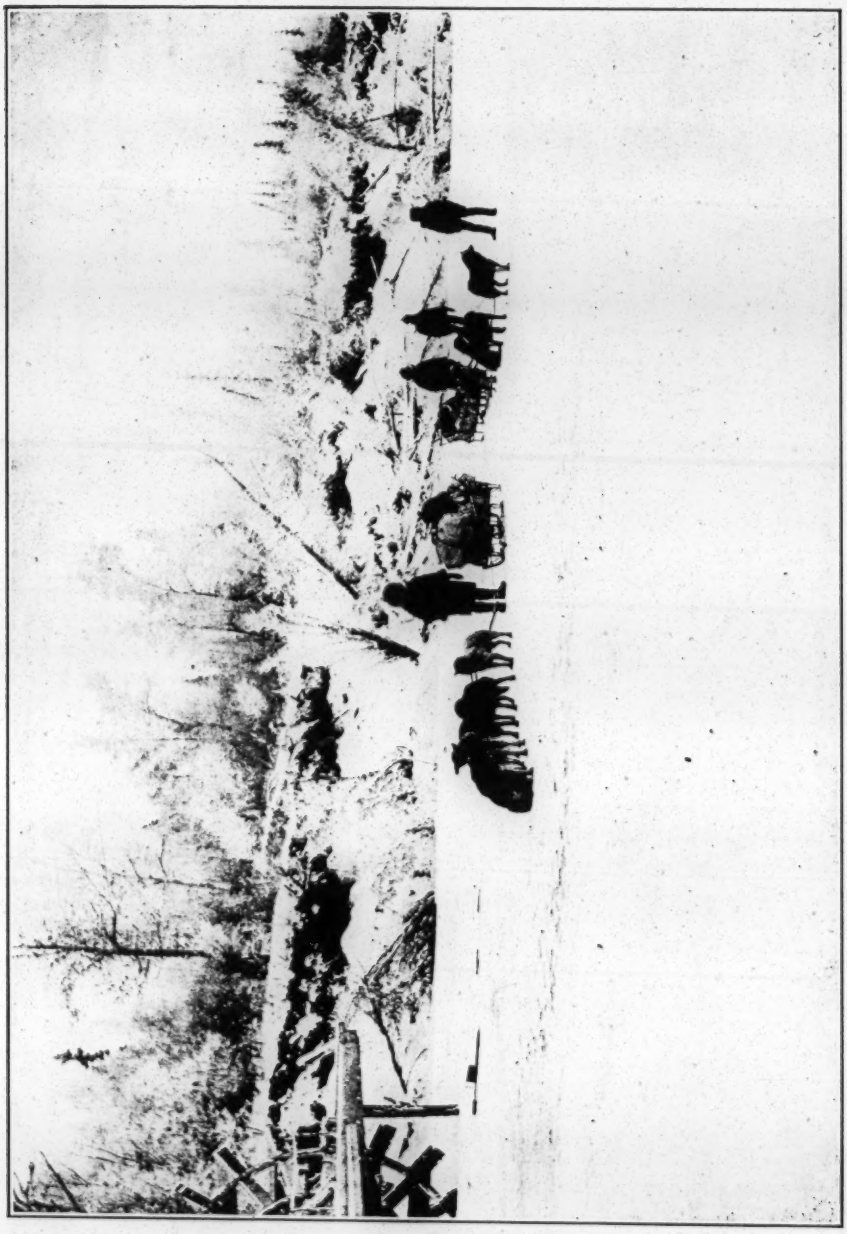
In winter—

1. Horse sleds.
2. Reindeer sleds.
3. Dog-team sleds.
4. Sleds drawn by men.
5. Packs carried by white men and natives.

All bases of supplies must be stocked for the entire year between June 15 and October 1. The hundreds and hundreds



Indian Birch Bark Canoe, used on the Rivers of Central Alaska, Containing a Fish Spear and Bow and Arrows



Traveling by Dog Team in Alaska

Observe the size of the load on the nearer sled. It probably weighs over 600 pounds and has been hauled 35 or 40 miles a day by 5 dogs

of tons required are carried to these bases in flat-bottomed, stern-paddle-wheeled steamboats, or in barges pushed by them—just such boats as still ply the waters of the Mississippi, the Ohio, and the Columbia. According to the depth of the rivers which they are intended to navigate, they are built to draw from 18 inches to 4½ feet of water and carry from 20 to 200 tons. Some few of these boats have been built in Seattle and steamed all the way to Alaska, convoyed by ocean steamers. Others have been built in sections at various places in the United States, even as far away as Philadelphia, and put together at Dutch Harbor or at St Michael. As a rule, they burn wood cut on the river banks, but recently some crude oil has been brought from California for fuel. At the close of the season these boats are hauled out on skides at some convenient place, or run into small streams, where they are protected from the terrible grinding force of the spring breakup.

During this same open period the mining camps must be supplied with necessities not laid in store during the winter freighting season, and the greater part of these stores is carried by pack animals.

The prospectors—the men who are breaking trails into the untrodden stretches of forest and mountain and sinking holes into the rich heart of a coming empire—must go their way alone and by means of their own activity and endurance carry each the three-quarters of a ton that is to keep them from starvation until another spring. A very few of these men use pack-horses, but the forage question is a serious one, and it is often next to impossible to take the horse to the place where packing is required. As far as water transportation can be utilized, it is many times easier and more efficient.

In going down-stream, flat-bottomed boats are used. These can be built of any required size, from any lumber available, and very often the boards for this purpose are whipsawed from trees right on the river bank. These unwieldy craft carry anywhere from a thousand pounds to ten tons or more, and are controlled, as they drift along with the current, by oars or by a single long "sweep" at each end.

A large portion of the prospector's journey into the hills usually follows up some stream which grows smaller and swifter each mile, until the water becomes too shallow to float a boat at all. For this purpose the poleboat is specially built. It is very narrow, with rounded bottom, and from 22 to 30 feet long, and carries from 1,200 to 1,800 pounds of provisions and equipment. This boat is propelled in either of two ways which circumstances at the time permit—a bridle is formed by attaching a divided line to two points on the boat, and a man follows along the bank with the tow-line. This is possible only when the path is free from trees and brush and steep inclines. In the operation of the other method a man stands erect in the end of the boat and pushes it forward by means of a long, light pole. Two experienced poleboat men can travel along at a surprisingly rapid rate against a swift current and with a considerable load. An inexperienced man attempting to handle a poleboat in swift water is apt to lose his outfit and his life as well.

The "Peterborough" canoe is very popular in Alaska for this same kind of work, but carries a much smaller load and is more expensive and harder to get.

Hastily constructed log rafts, while only resorted to when nothing else is obtainable, are so commonly used in Alaska that the list would not be complete without them.

The last stage of the prospector's journey, from the point where his boat becomes useless to the headwaters of the creek he is following, must be made on foot, and all indispensable supplies carried on his back. The balance of his outfit is placed in a raised cache and left until

Seals

Photos from U. S. Revenue Cutter Service

Feeding the Dogs

Reindeer Fawns

Photos from U. S. Revenue Cutter Service

Going Out on the Ice for Whales in April

the sledding season begins. In the regions where Indians are to be found, they can usually be hired to carry packs. They are able to carry from 50 to 100 pounds over long distances.

Here in "the States" the closing in of winter means the limiting of traveling facilities, and often renders quite impossible journeys by means of the cruder forms of transportation. Roads are blocked with deep snow, melting weather creates highways of bottomless mud, and many of the streams have too much ice to be crossed by boats and not enough to bear up animals and vehicles.

In Alaska, however, the "freeze-up" is the magic key which opens wide the trails to every valley and distant mountain fastness. It is Nature's unlimited franchise to the "sourdough" prospector, who, with a strong back and a weak mind, responds with tireless effort to the goadings of the gold fever within his veins. It extends equal privileges to the fur hunter, as he follows his long line of traps, and to the toiling freighter and the scheming tradesman, each of whom must have his surer and not always smaller share of the earth's rich treasure.

Broad streams and rushing torrents are bridged with ice strong enough to bear up a railroad train, and the mushy tundra, with its rough surface entirely made up of alternate water-holes and nigger-head hummocks, is leveled off with layer after layer of wind-driven snow.

Every stream becomes a highway. No part of the broad expanse is longer impassable, and the distribution can now begin from the stocks of supplies cached at convenient points by water transportation to the widely scattered places where those supplies are to be used.

The most efficient freighting unit for winter transportation is the single horse and sled. The sleds used are of various patterns, but the best one is built solid on a single pair of runners, cut under at each end, about 8 or 9 feet long, with a tread of about 28 inches, and with the bed 10 or 12 inches above the ground. The load is lashed on and, being low is not easily overturned. An ordinary load for such a sled is from 1,200 to 1,400 pounds, but on a good trail this amount may be increased to a ton. The great difficulties encountered in the use of horse-sled freighting outfits are that great labor is required in choosing and breaking a trail, the horse is easily injured by extreme cold and must have careful attention, and the amount of forage required for the distance traveled is enormous. These disadvantages are compensated for only by the large size of the load hauled. In point of speed, especially over unbroken trails through deep snow, the horse is not in the same class with the dog team.

The introduction of domestic reindeer into Alaska has given that country a new and useful animal which is already becoming a source of comfort and employment for the native Indians, whose condition in every way is deplorable. By them these animals will have some usefulness as beasts of burden, but for anyone to maintain that they are, or will become, an important adjunct to the transportation facilities of the country, is misleading. They have been tried for various kinds of work during a period of several years, and have been unreliable and inefficient in comparison with horses or dogs. If driven through a country where moss can be found for them to feed upon, they can at least carry their own bodies, and in that way become a source of meat supply that may, as has been demonstrated in some notable instances, perform an invaluable service in the saving of human life.

Peculiarly fitted for Arctic travel, reliable and faithful in his work, and devotedly attached to the hand that feeds him and the voice which commands him by entreaties or by curses, the dog plays a part in Alaskan life that is indispensable and for which there is no substitute.

Alaska is not behind the times in up-to-date methods and appliances. Her camps are lighted by electricity and her mines are worked by means of machinery of the latest approved type, yet the United States mail is carried from one end to the other by dog teams.

While men in the freighting business use horses and mules largely, the individual miners and others do not attempt to maintain these animals, but have dog teams with which they do all of the small hauling for their establishments. Wood for fuel is delivered from the mountain side to the cabin door; frequent trips are made to the nearest trading store for provisions, for the mail, and for the society of fellowmen, and excursions to distant camps and prospecting trips into the hills are made almost exclusively by dog team.

The United States military telegraph system, operated by the Signal Corps of the Army, maintains a dog team at each of the stations along its 1,400 miles of land lines. These teams are used by the repairmen in going out on the line to repair breaks. They carry, besides tools and materials, a small tent, stove, bedding, and food for men and dogs, so that they can take care of themselves if kept out for several days.

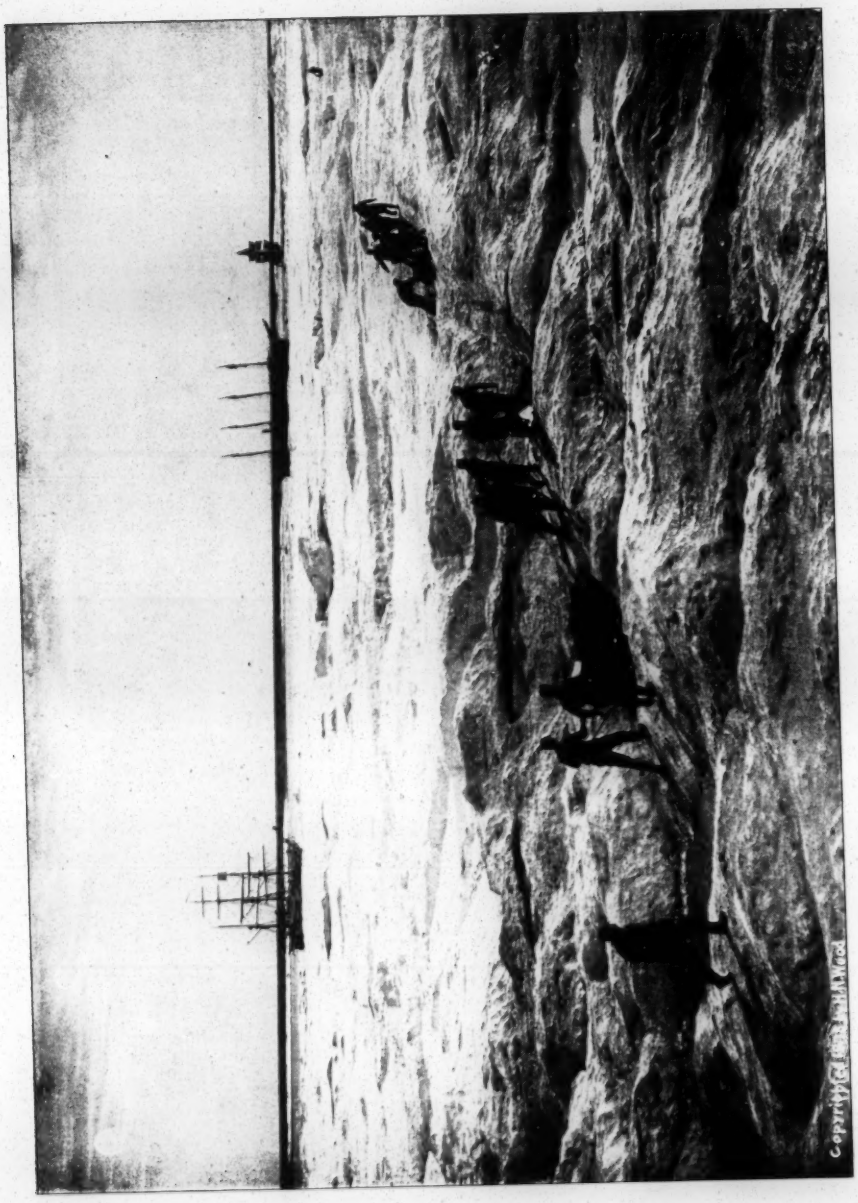
A few years ago different breeds of dogs were used in different sections, but increased travel has brought into service all of the dogs to be had in the country and hundreds in addition that have been brought from the outside. The native malamutes, huskies, and dogs from the Mackenzie and Peel rivers are more hardy and last longer in service than the outside dogs. Newfoundlands, Saint Bernards, setters, and shepherd dogs are superior in intelligence, but they are lacking in endurance, require more careful feeding, and their feet are easily frostbitten, which renders them useless for the time being.

In the region of Norton Sound it is the custom to hitch dogs in pairs with a leader in front, a team usually consisting of seven or nine dogs. The Indian pattern harness is used, and the sled is of the basket type, about 10 feet long, with a track 20 inches wide, and capable of carrying from 400 to 600 pounds. This method of hitching is practicable only where the trail is wide, as along the shore ice.

In the interior the Indians use basket sleds, but with a track about four inches narrower and of lighter construction, and they hitch the dogs in similar harness, but string them along a line with considerable interval between dogs. From 300 to 400 pounds is the capacity of this sled, and the team usually consists of from 4 to 6 dogs. The native sled is made of spruce, with green birch runners, but the white man has built for his own uses a sled of similar pattern, made of hickory and oak and shod with steel. He also uses harness made in the factories outside, consisting of a collar stuffed with hair and traces which snap into rings on the collar of the dog next in rear.

The pioneers from the northwestern states brought with them to Alaska a type of sled which is now known as the "Yukon sled," a name probably given to it by dealers in San Francisco and Seattle. It is used for general knock-about purposes, being very strong and with the bed less than 6 inches from the ground, but short and of small capacity. This sled is a miniature of the one described as being the best type of horse sled.

Dogs are fed but once a day—in the evening, after the day's work is finished—because they are unable to work after eating. They thrive best upon a feeding of 7 or 8 pounds of corn-meal mush per dog, into which has been cooked a pound of sun-dried salmon (without salt). Of course they will get along on a sufficient quantity of almost anything that can be eaten, and many long journeys have been accomplished on absolutely nothing but dried fish and snow. A day's travel with



Hauling Supplies to Whale Ships on the Arctic Coast of Alaska

a dog team, under ordinary conditions of load and trail, is from 35 to 45 miles.

The driver does not often ride on the sled. He is usually anxious to haul as large a load as possible. His entire attention and strength are likely to be needed to keep the sled on the trail, and, besides, in very cold weather continuous running is necessary to keep from freezing.

Alaska is subject to frequent manifestations of that hysterical and frequently fatal malady—the gold fever. A rumor is started that "Long Bill" has uncovered a rich find on some creek on the upper Koyukuk, or that "Windy Jim" and his partner have sneaked into camp with pokes full of dust from some mysterious creek equally far away. There is at once an exodus in the direction of the new Eldorado. The price of a dog goes up from $40 to $100 or $150. Every kind of canine that can pull a pound, from Great Dane to fox-terrier, is impressed.

At such times men start out without other assistance than the stimulus of their chimerical visions. What food, clothing, and bedding they take must be packed on the back or drawn on a light hand-sled.

Some men have traveled all the way from Fort Yukon to Coldfoot, and others from Circle City to the Tanana, on foot and alone, with packs of 60 pounds on their backs.

Here in our home country, where every one is now and then whirled along in a luxurious modern railroad train, and, arriving at his destination, is besieged by hacks and cabs and baggage wagons of infinite variety and number, with street cars passing by and broad, level streets stretching out before him, it is quite impossible to realize the conditions under which transportation is accomplished in far-off Alaska.

Private enterprise is doing much to improve the facilities, and the government is permitting the people of Alaska to spend their own tax money on the improvement of roads and trails; and Congress would be doing little enough if it would give liberal assistance to the railroads that are struggling for a start in that trackless country.

# WINNING THE WEST*

## AN ACCOUNT OF THE MARVELOUS PROGRESS OF OUR RECLAMATION SERVICE IN RECLAIMING THE DESERT

By C. J. BLANCHARD

ENGINEER, U. S. RECLAMATION SERVICE

AMERICAN irrigation was old when Rome was in the glory of its youth. The ancient aqueducts and subterranean canals of South America, extending for thousands of miles, once supplied great cities and irrigated immense areas. Centuries before the venturous Norseman landed upon the bleak and inhospitable shores of New England, a large population dwelt in the hot valleys of our far Southwest. From the solid rock, with primitive tools of stone, they cut ditches and hewed the blocks for many chambered palaces, which they erected in the desert or on the limestone ledges of deep river canyons.

These voiceless ruins, older than the memory of many centuries, tell the story of a thrifty, home-loving and semi-cul-

*An address to the National Geographic Society, January 12, 1906, with photographs from the U. S. Reclamation Service.

tured people, concerning whose fate history brings us no word. In these palaces and in many miles of canals we may almost read the story of another Egypt—a people toiling under the burning sun of the desert, wearily and painfully executing the commands of an American Pharoah.

Coming down to a period less remote and only slightly less interesting, we mark the first page of our own written history. Here in the sixteenth century Coronado, the first great American explorer, swept up the Rio Grande Valley and journeyed as far north as Kansas. In New Mexico he found a pastoral race dwelling in pueblos and practicing the gentle art of irrigation as had their forefathers, perhaps as far back as in the days of Abraham. Certainly their agricultural methods were in no wise different from those which prevailed in the days of the prophets. Even unto this day their grain is gathered in great willow baskets, is threshed by the trampling of sheep and goats and winnowed by the winds. Fields which were cultivated three centuries ago are still producing crops each year.

Some of these thoughts came to the government engineers as they ran their lines of levels in the valley of Salt River in Arizona, and it seemed to them a proper task for the greatest nation on earth to restore once more the oases of verdure which the desert had long ago obliterated.

### AN AREA EQUAL TO MASSACHUSETTS HAS BEEN WRESTED FROM THE DESERT

During the last quarter of a century a crop-producing area of 10,000,000 acres, or another state of Massachusetts, has been wrested from the desert. Irrigation canals long enough to span the earth twice and representing an outlay of $90,000,000 have been built. Every year this area returns a harvest valued at more than $150,000,000, and 2,000,000 people dwell in prosperity and content where only a short time ago the wilderness reigned.

Uncle Sam is today the largest owner of the Great American Desert, no doubt because it was not considered worth stealing. For many years the sentiment has been growing that the government should make habitable this vast empire which is so great potentially. This sentiment crystallized into a law on June 17, 1902, when President Roosevelt affixed his signature to the national irrigation act. The principal features of this law are briefly:

### THE PROVISIONS OF THE RECLAMATION LAW

First. A reclamation fund in the Treasury, consisting of the proceeds from the sales of public lands in the 16 arid and semi-arid states and territories.

Second. A Reclamation Service in the U. S. Geological Survey to investigate and report on the irrigation projects for the approval of the Secretary of the Interior, who may authorize construction and let contracts, providing the money is available in the fund.

Third. The return to the fund of the actual cost of each project by the sale of water rights, payments to be made in a series of installments running over a period of ten years.

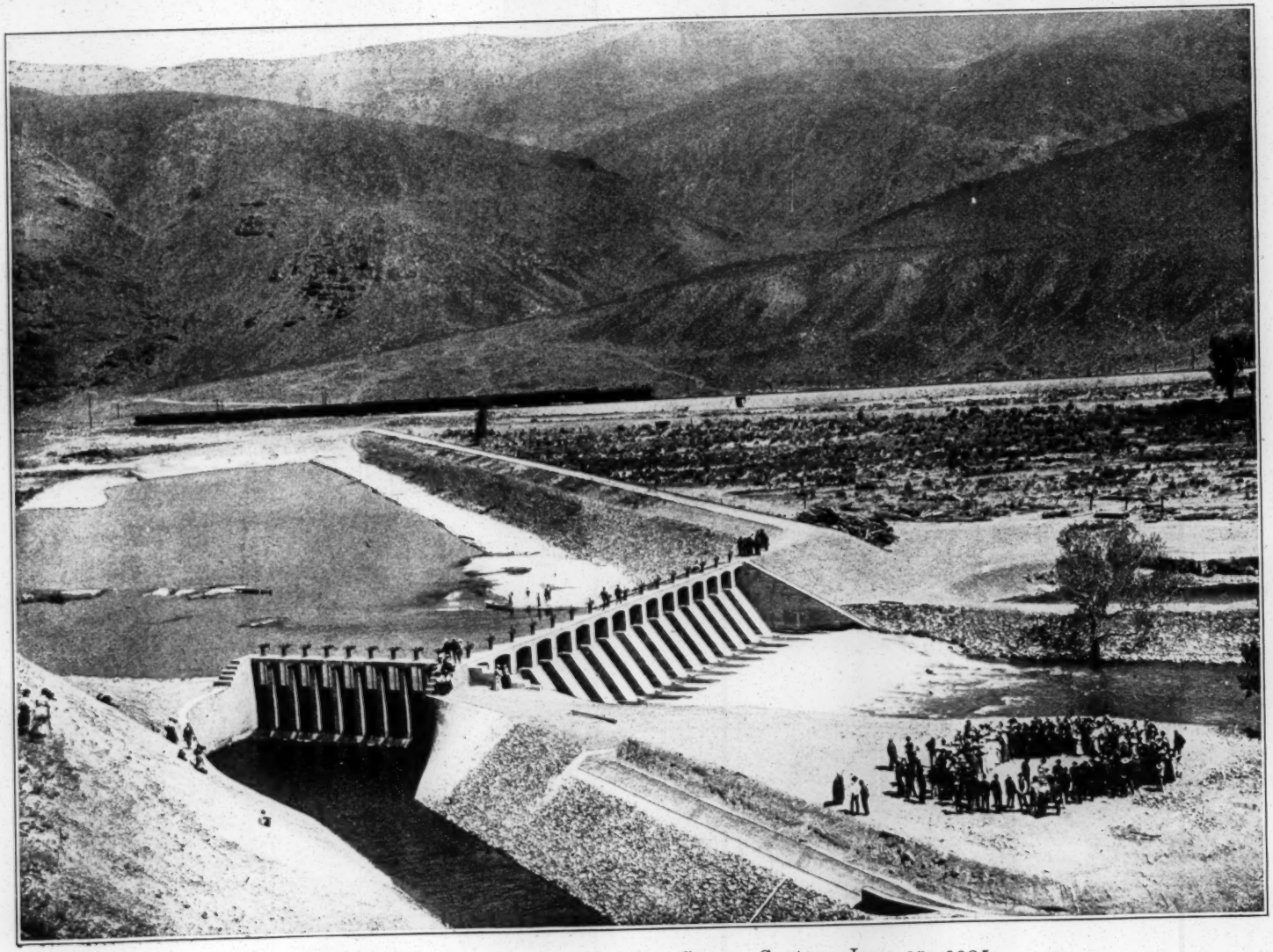
Fourth. The holding of public lands for actual settlers under the homestead act, in small farm units sufficient to support a family; no commutation to be permitted.

Fifth. The sale of water rights to private land owners, but not for more than 160 acres, making land monopoly impossible and forcing the division of large estates.

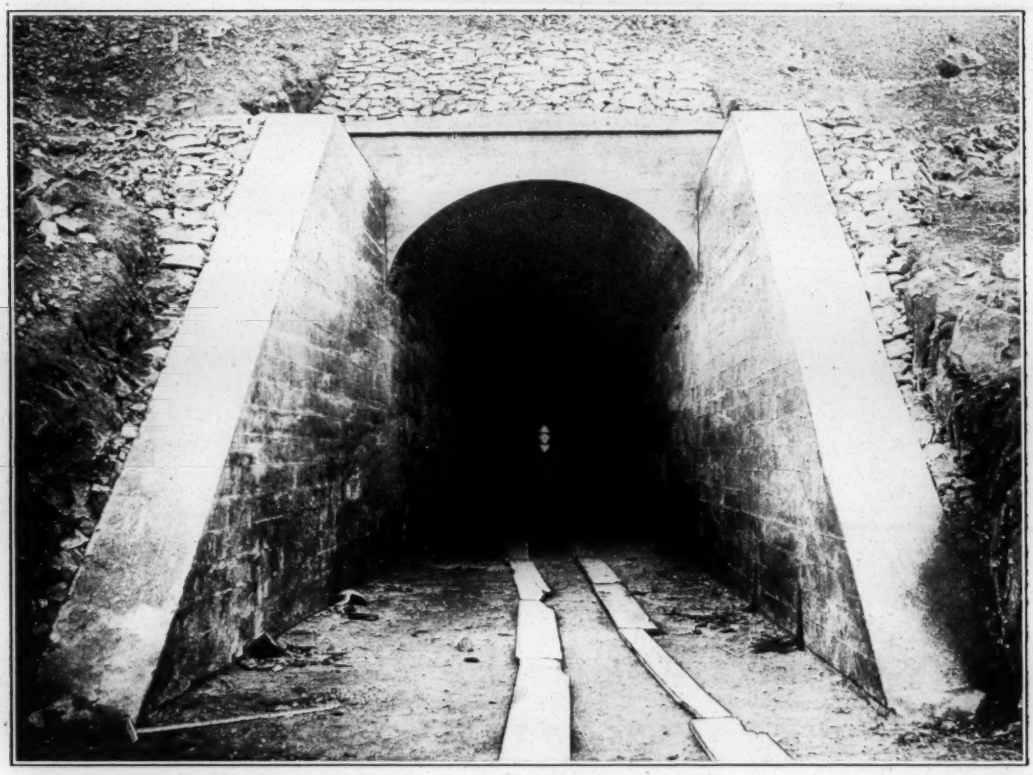
Sixth. The ulitmate turning over to the people of the irrigation works, except the reservoirs, to be operated and managed by them under a system of home rule. The actual users of the water in ten years after the completion of the works will have repaid to the government the amount of its loan without interest. The money so returned may again and again be expended on other works.

At Work on one of the Ditches of the Truckee-Carson Project in Nevada

One of the Canals of the Truckee-Carson Project, Nevada



Opening one Branch of the Truckee-Carson System, June 17, 1905



"The Canals Tunnel through Hills"

The Reclamation Service in the comparatively brief period of its existence, and notwithstanding the enormous extent of the country, embraced in the arid regions—two-fifths of the United States—has completed the surveys and perfected estimates for twenty-four irrigation projects, all of which have been approved by the Secretary. Upon twelve of these actual construction has begun, and on one (the Truckee-Carson) a large and important unit was completed and formally opened on the third anniversary of the reclamation act.

THE TRUCKEE-CARSON WORKS IN NEVADA

The first of the great works undertaken by the government is in Nevada. In the bed of ancient Lake Lahontan and embracing what was long known as Forty-Mile Desert, the most desolate and arid spot on this continent except Death Valley, the engineers completed the plans for an extensive irrigation work involving some rather novel engineering features. The principal engineering features of this project are lifting the waters of the Truckee River into the great canal which will carry them over into the Carson River reservoir, whence they are diverted into laterals and carried out upon the desert. In their entirety the plans involve extensive storage works on Lake Tahoe and the complete utilization of the four rivers which now flow out into Carson sink and are evaporated. The works so far completed are of the most permanent character. The great

dams on the Truckee and Carson rivers, the former 110 feet in height, are beautiful and finished products of modern engineering. There has been no disposition to save on cost at the expense of this work. The government must maintain these structures for ten years, and it is building them so that when it turns them over to the people they will get their money's worth.

The long lines of canals, many of them large enough to carry rivers, are lined in places with cement, and obstacles in the route, such as hills, are tunneled and the tunnels are cement-lined. When complete this project will cost more than $9,000,000 and will render productive more than 400,000 acres of land now absolutely worthless, but which, irrigated, will readily sell for $30,000,000.

Government Sawmill in Arizona, built by the U. S. Reclamation Service. Millions of feet of lumber have been cut for the Government work

THE SALT RIVER PROJECT IN ARIZONA

In the land of mystery, of lost races and hoary ruins, in the warm and sunny valley of Salt River, we find one of the greatest engineering works in the world now well under way. Many miles above the valley, in what was once an almost inaccessible region, peopled only by the murderous Apache and the old-time outlaw, the Salt River and its tributary, Tonto Creek, emerge from the canyon

and flow across a broad, level flat. Here 2,000 men are at work erecting the Roosevelt dam, which is to be one of the highest in the world, exceeded in height by only one other, and that also a structure of the Reclamation Service. The Roosevelt dam will be of uncoursed rubble masonry (sandstone and cement) with arch upstream. It will be 800 feet long on top, 235 feet at river bed, and its contents will be 300,000 cubic yards. It will rise 284 feet above the lowest foundations, and the height of water against the dam will be 230 feet. A power canal 18 miles long with a drop of 220 feet is now being utilized to furnish 4,000 horsepower in constructing the works.

THE GOVERNMENT IS MAKING ITS OWN CEMENT

When the reservoir is completed the water will flow in the river channel for 44 miles, and then be diverted by means of canals to the irrigable lands. In the construction of the dam 240,000 barrels of cement are required. The question of cement was not the least of the problems which troubled the minds of the engineers. The isolation of the dam site—60 miles from a railroad—and a tendency on the part of cement manufacturers to put as high a value on their product as they thought it would bear, offered a problem which nearly stumped the engineers. The first bids were $9 a barrel, making the item of cement a matter of more than $2,000,000 alone. Then it was that the engineer with the geological bump got busy. A hasty reconnaissance of the nearby country disclosed the fact that a ledge of splendid limestone outcropped just above the dam site, while hills of blue clay were within a short distance. Notwithstanding the vigorous protests of the cement manufacturers and their offer of cement at about half the price of former figures, the Secretary of the Interior authorized the building of a cement mill. This mill has been in successful operation for several months and is turning out 250 barrels of first-class cement every day, at a cost which will save the settlers of the Salt River Valley more than a million dollars on the price first offered by the trust.

THE MOST CAPACIOUS RESERVOIR IN THE WORLD

The question of supplies was an important one, and to meet the conditions a wagon road was constructed, to the cost of which the municipalities of Phœnix, Mesa, and Tempe contributed $75,000. This road was constructed by the government engineers, and not by contract, and is one of the most spectacular pieces of engineering in the west. For more than 40 miles it is in the canyon of the Salt River, many miles having been blasted from the precipitous walls. The day laborers were mostly Apache Indians, remnants of Geronimo's band. The road opens up a new region of beautiful scenery, and when the great dam is completed the Tonto reservoir and the Roosevelt dam will attract the transcontinental visitor. The reservoir created by the dam will be one of the largest artificial lakes in the world. Its capacity will be ten times greater than the Croton reservoir. It will contain more water than is stored by the Assouan dam. One million four-hundred thousand acre-feet, or enough water to cover that many acres a foot deep, will be held in this basin until needed by the farmers in the valley below. At the present time in the lowest part of the reservoir site is a thriving city called Roosevelt, with a population of nearly 2,000; a city with electric lights, water works, school-houses, stores, and churches, which will be submerged more than 200 feet when the dam is completed. Ten thousand horse-power will be developed from the dam and from drops in the canals, all of which will be utilized to pump the underground water of the valley to lands above the gravity systems.

WHERE COURAGE WAS EVEN MORE NECESSARY THAN ENGINEERING SKILL

Coming northward into western Colorado we find the engineers of the Recla-

mation Service constructing one of the most spectacular works ever attempted in the West, a great tunnel nearly six miles in length and passing under a mountain 2,000 feet high. The history of this project is one of danger, daring, and heroism. Flowing in deep canyons in places more than half a mile below the surface of the country, over precipices, through narrow gorges, the Gunnison Canyon had never been explored until Mr A. L. Fellows of the Reclamation Service and one companion essayed the feat.

They fastened their instruments and provisions on an inflated rubber mattress and set forth upon what proved to be a most thrilling and exciting adventure. Over a greater portion of the trip they were so far below the party which followed them along the brink of the canyon that no voices could reach them. At other points they were lost from sight, during which time the anxious watchers were fearful of their safety. After several days they finally emerged by way of the Devil's Slide, having in the last hours of the trip suffered a loss of their boat, their instruments, and provisions, and narrowly escaped death.

Fortunately Mr Fellows had his notes in oil skins secured to his person. From these notes it was possible to select a site in the canyon for a tunnel through which the waters of the Gunnison River will be carried to supplement the insufficient flow of the Uncompahgre River, and thereby make fertile 130,000 acres of land in the valley of the latter stream. The Reclamation Service is doing this work under force account, owing to the failure of the contractors to comply with the regulations. More than 6,700 feet of this great underground waterway are now completed and the work is being pushed forward vigorously night and day. It will be completed in 1908. The tunnel and canal system will cost about $3,000,000.

THE PATHFINDER DAM IN WYOMING

Proceeding to the northward, we find progress is being made in the construction of another great dam, the Pathfinder, which is located upon the exact spot where General John C. Fremont nearly lost his life while attempting to pass through the Platte River Canyon in a boat. This dam will have a height of 210 feet and will create a reservoir storing more than a million acre-feet. It will prevent for all time to come the disastrous floods on the North Platte, which annually destroy property valued at many times the cost of this structure. In connection with this dam there is being constructed an interstate canal 140 miles long and covering 200,000 acres in eastern Wyoming and western Nebraska. Its route is along the old overland trail.

THE HIGHEST MASONRY ARCH IN THE WORLD

In northern Wyoming, near the spot that Mr Seton-Thompson has made famous as the resting place of Wahb, the grizzly, work is now under way on the Shoshone dam, a concrete masonry arch and the highest structure of its kind in the world. It will lock a very narrow granite canyon, so that in cubical contents it will not compare with any one of several other dams, but in its great height it tops them all. From bed rock to top it will be 310 feet high. At its base it is only 85 feet long, and on top only 200 feet. The bed-rock conditions at this site proved a great surprise to the engineers. On first investigation it was thought that the river flowed on a granite foundation, but when the diamond drills were brought in they went down 88 feet in places before finding a permanent base. Boulders 38 feet in thickness were penetrated resting on beds of sand and gravel. The site of the dam is in an almost inaccessible region, and, as in Arizona, it was necessary to construct a road up the canyon for several miles. This is destined to be one of the new routes to Yellowstone Park, and it will become popular by reason of the scenic beauties which it opens up. The Shoshone project, with

its great dam, its hundreds of miles of canals and ditches, will cost about $2,250,000 and will irrigate 100,000 acres of land.

At the foot of the Black Hills, in South Dakota, in the valley of the Belle Fourche River, another great work is going forward rapidly. This project involves the construction of the highest earthen embankment in the world, over 115 feet high, more than one mile in length, and 20 feet wide on top. This great dike will create a lake about 20 miles long by 5 miles wide and in many places more than one hundred feet deep. The entire flow of the Belle Fourche River will pass into this artificial lake, and will then be diverted in canals to water about 85,000 acres of very choice land, a large percentage of which belongs to the government. The cost of the project will be $2,700,000, and it will be completed early in 1907.

A Cabbage Farm, near Phœnix, Arizona. Five crops are raised each year

### A REMARKABLE TRANSFORMATION

In southern Idaho the Minidoka project, located on the Snake River, embraces about 100,000 acres of sage-brush land. Work is well along on this project, which involves a rock-fill dam across the Snake and many miles of canals. The dam is now within 30 feet of closing the river, and canal lines extend all over the tract. A remarkable transformation has taken place in this section since the com-

ing of the engineers. A year ago last spring I drove across this tract of land with the supervising engineer, and we camped for the night on the banks of the river at a point which we marked out as the site for the future metropolis of the valley. In fact we drew a rough plan of the town, which was afterward enlarged and then approved by the department.

That night, save for our own campfire there was no other evidence of human habitation within 30 miles of us; only a vast expanse of sage brush extending to the horizon on every side. Last October, in a passenger coach, I went over the same route, traveling on a new line of railroad. I passed three new towns having a total of more than 120 business houses, including three newspapers, one private and two state banks. Every 80 acres under that project has a dwelling upon it, and where a little over a year ago the desert was in full control, there now dwell nearly 4,000 people. All of this development has taken place before the water has actaully been supplied to a single acre. Next spring Uncle Sam will hold a public sale on this project, when he will put on the market the lots embraced in the three town sites which have been laid out thereon.

An effort is being made to secure the consent of Congress to permit the money received from the sale of these town lots to be loaned to these towns for the construction of water works and sewerage systems, the money to be repaid in accordance with the provisions of the reclamation act and the work to be done by the government.

THE VALLEY OF SNAKE RIVER IN WYOMING

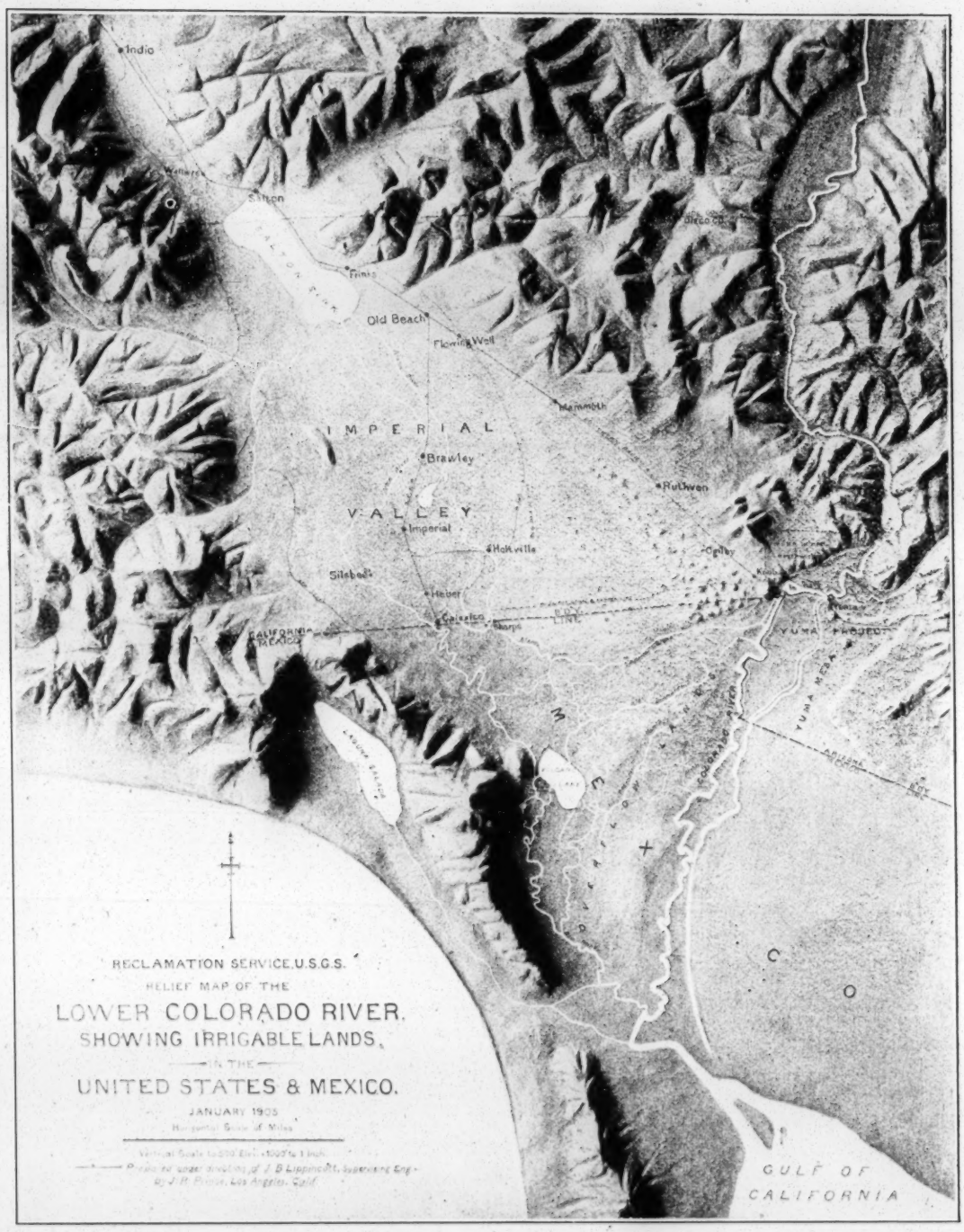
A tremendous development has taken place in the last few years in the great valley of Snake River, and approximately 1,000,000 acres have been reclaimed from the desert. All of the normal flow of this stream above Glenn's Ferry is now utilized and the further extension of irrigation works makes the question of flood storage an exceedingly important one. This question has not been overlooked, and the government has reserved numerous lakes at the headwaters of the Snake in Wyoming, and in the near future will begin the construction of storage works. Water rights are being adjudicated and a plan is being formulated whereby all of the canal systems, by contributing to the cost of these works, may have their water supply increased.

THE AMERICAN NILE

It is a far cry from Idaho to Egypt, but not so far after all if we remember that there is an American Egypt and an American Nile. Rising in the snow-capped mountains of western Colorado and Wyoming, the Colorado, America's Nile, drains an area of 230,000 square miles and pours a turbid flood into the Gulf of California. In its lower valley, the climate, soil, and products are singularly like those of the great valley of Egypt. Here the date palm grows in all its tropical luxuriance, and the Department of Agriculture is only waiting the advent of canal-borne water to introduce more than 200 varieties of this fruit. Here the orange and pomelo produce abundantly. It is a spot where Nature smiles the whole year upon the labors of the husbandman, and it is so hot that dwellers there are said not to worry about their future home.

Across the great Colorado River, about 12 miles above Yuma, the government is throwing a dam the like of which this country has never seen before. It is of the East India weir type, a great mass of masonry resting upon sand. This style of dam was made necessary for the reason that no bed rock was found at this site, nor was any found at any other point on the Colorado where it would have been feasible to construct a dam for irrigating the lower valley. The Laguna dam will have an extreme length across channel of 4,780 feet. Its height will be only

The Site of the Pathfinder Dam, on the North Platte River, Wyoming


Indio
Salton
Old Beach
Flowing Well
Mammoth
IMPERIAL
Brawley
VALLEY
Imperial
Holtville
Silsbee
Heber
Calexico
Mexicali
Ruthven
Gray
YUMA PROJECT
YUMA MESA
ARIZONA
CALIFORNIA
MEXICO
GULF OF CALIFORNIA
RECLAMATION SERVICE, U.S.G.S.
RELIEF MAP OF THE
LOWER COLORADO RIVER,
SHOWING IRRIGABLE LANDS,
IN THE
UNITED STATES & MEXICO.
JANUARY 1905

19 feet, but its length up and down stream will be 346 feet. Its weight will be approximately 600,000 tons, and its cost will be $797,650. The diversion headworks will be on both sides of the river, connecting with two canal systems, which will supply lands in California and Arizona. The headgates are so arranged as to draw off only the top foot of water, thus avoiding most of the silt. The silt deposited will be sluiced out by opening gates which discharge back into the river. The problem of silt which confronted the engineers here can be better understood when it is known that during a flood the Colorado River in 24 hours carries past the dam site 1,500,000 tons of silt.*

Many miles of levees on both sides of the Colorado and Gila rivers will be built to provide against the annual inundation of the bottom lands. These levees will be of the same type as on the lower Mississippi. The canal crossing the Gila River will pass several feet below the river bed and will be in a siphon of steel and concrete about 3,300 feet long.

Especial interest attaches to this work by reason of the very unusual conditions which now exist in this region. In former times the Gulf of California extended as far north as Indio. The Colorado deposited its great burden of silt and detritus into this arm of the sea and finally built up a bar clear across it, shutting off a portion of the gulf. Under the burning sun of the desert this inland sea gradually evaporated. From time to time the river overflowed this dike and spilled some of its floods into the lake, carrying the salts to the deepest part of the depression, which became heavily impregnated, and leaving on the higher grounds a portion of its rich sediment brought from its mountain drainage. The Colorado River flows through its delta on top of a dike which it has built up, so that its channel is at a higher elevation than the country through which it passes.

### LOSING CONTROL OF THE RIVER

In 1900 men came and viewed the sunken desert and, realizing its possibilities if watered, began the construction of a canal which headed in the river a short distance above the international border. Complications arising in regard to this diversion, the heading was moved farther down stream into Mexico. The canal for some distance was just below the international boundary and then followed an old river channel, turning northward into California into what is now called Imperial Valley. Irrigation wrought its usual miracle. Hundreds of settlers flocked into the valley and took up homes. Railroads were built, towns grew up, and last summer more than 80,000 acres were under cultivation and 8,000 people were living below the level of the sea. There were no permanent headworks in the canal, and a great flood came which could not be controlled. The canal, having a heavier grade than the river channel, gradually took an increasing share of the water, until at this time the Colorado is pouring its floods as well as its normal flow into the Salton Sea, now a great body of water 60 miles in length and many miles wide. The railroad has been submerged and the company forced to build on higher grounds. The salt works, which had become a prominent industry, have been destroyed and there is danger, if the river cannot be returned to its proper channel, that the rising sea will submerge all of the valley which is below sea-level. Several of the best engineers of the country are in consultation, and it is hoped that the problem of returning the Colorado to its proper channel will be solved.

### THE KLAMATH BASIN

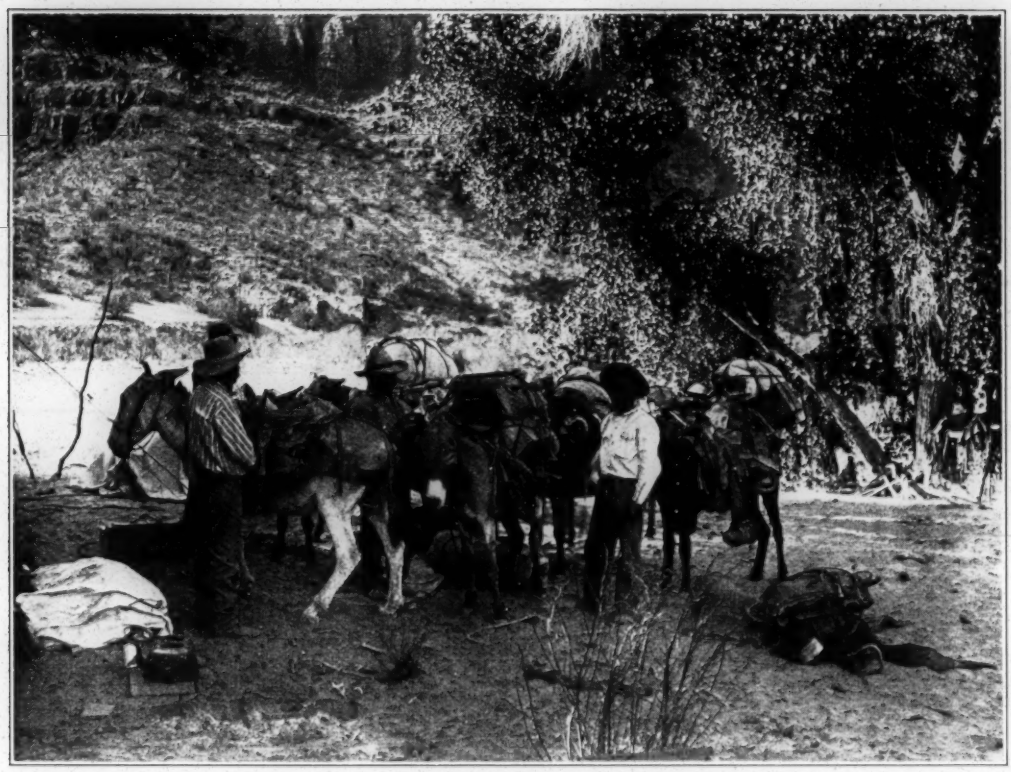
In northern California, in the "Land of Burnt out Fires," and extending over the line into Oregon, work has just begun upon what is classed as one of the most unique of all of the projects undertaken

by the Service. It is known as the Klamath project, and involves features of irrigation, storage, and drainage in unusual combination. The Klamath Basin includes about 400,000 acres of land, of which 250,000 are irrigable from this project. Some of the topographic features are singularly interesting. Elevated the valley. Lost River, which rises in Clear Lake, winds its tortuous way for 60 miles, finally emptying into Tule Lake, of which it is the only source of supply. Tule Lake is only six miles from the source of Lost River. By constructing a dam in the river at Olene, it is proposed to cut off the river from the lake and

Indians (Apaches), survivors of Geronimo's Band, building a Road to the Roosevelt Dam, Arizona. (See page 89)

some 50 feet above the valley is the upper Klamath Lake, the outlet of which is Link River, which flows through Lake Euwane at Klamath Falls into Klamath River. Upper Klamath Lake is the principal source of supply for the lower part of the project. By means of a deep cut the waters of this lake are drawn into a large canal and carried southward into utilize the water at various points in its valley. Tule Lake will dry up. The lake bed will then be irrigated from the main canals supplied from Klamath Lake. Lower Klamath Lake is considerably higher than Klamath River, its level being maintained by a natural dike or ledge of basalt which crosses the river at Keno. By excavating a channel seven feet deep

through this dike, it will be possible to drain nearly the whole of Lower Klamath Lake, exposing many thousands of acres of rich tule lands, which will also be brought under irrigation from the main canals. While exceedingly unique, all of the engineering features are comparatively simple and the average cost



Moving Camp, U. S. Reclamation Service

per acre is the lowest of any of the projects so far approved. The climate of this section is temperate, the soil is fertile, the products include alfalfa, all of the cereals of the temperate zone, vegetables, deciduous fruits, etc. The Klamath basin is situated about equally distant from San Francisco and Portland.

In the pleasant valleys of the Payette and Boise rivers in Idaho, a region favored with an equable climate and fertile soil and a most progressive people, one of the largest of these irrigation projects has just been approved. Bids are now being advertised for the first units of this project, involving the expenditure of $1,300,000. In its entirety the project provides for the reclamation of 372,000 acres of land, mostly in Boise Valley, an area equal to twice the cultivated acreage of Rhode Island. The canal systems now in operation and irrigating about 100,000 acres are to be made a part of the project and utilized as feeders or laterals. Great dams in both the Payette and Boise rivers will hold back the floods, and by a long canal, a portion of which passes through a deep

cut, the waters of the Payette drainage will be brought over into a reservoir in the Boise Valley to supplement the insufficient supply of the Boise River. It will require a number of years to complete this work and the expenditure of about $9,000,000. At the present time this section has a population of about 15,000. When the works are finished it will easily support as dense a population as the Salt Lake Valley, or 120,000. Nearly $40,000,000 will be added to the value of taxable property in land values alone.

Three projects have been approved in the state of Washington. The Okanogan, in the northern part, to cover about 10,000 acres, will cost about $500,000.

Two projects in Yakima Valley, the Sunnyside and the Tieton, aggregating 64,000 acres of land, at an approximate cost of $1,750,000. The Yakima Valley contains an irrigable area of approximately 500,000 acres, and with the storage in the lakes at the headwaters it is estimated that the water supply will be sufficient for 340,000 acres. In addition to this, there are 100,000 acres in the Yakima Indian reservation which may be brought under canals at a moderate cost, but for which there is no late summer flow in the river. The development of a comprehensive system of irrigation in this valley is to be accomplished by the successive construction of several units of a greater project, the work being gradually extended to embrace the entire irrigable area. Not less than $12,000,000 will be required. The present plans provide for the purchase of the Sunnyside Canal, the most important irrigation system in the valley, and its enlargement and extension to cover new areas.

### A SUMMARY OF WORK DONE AND ESTIMATES FOR THE FUTURE

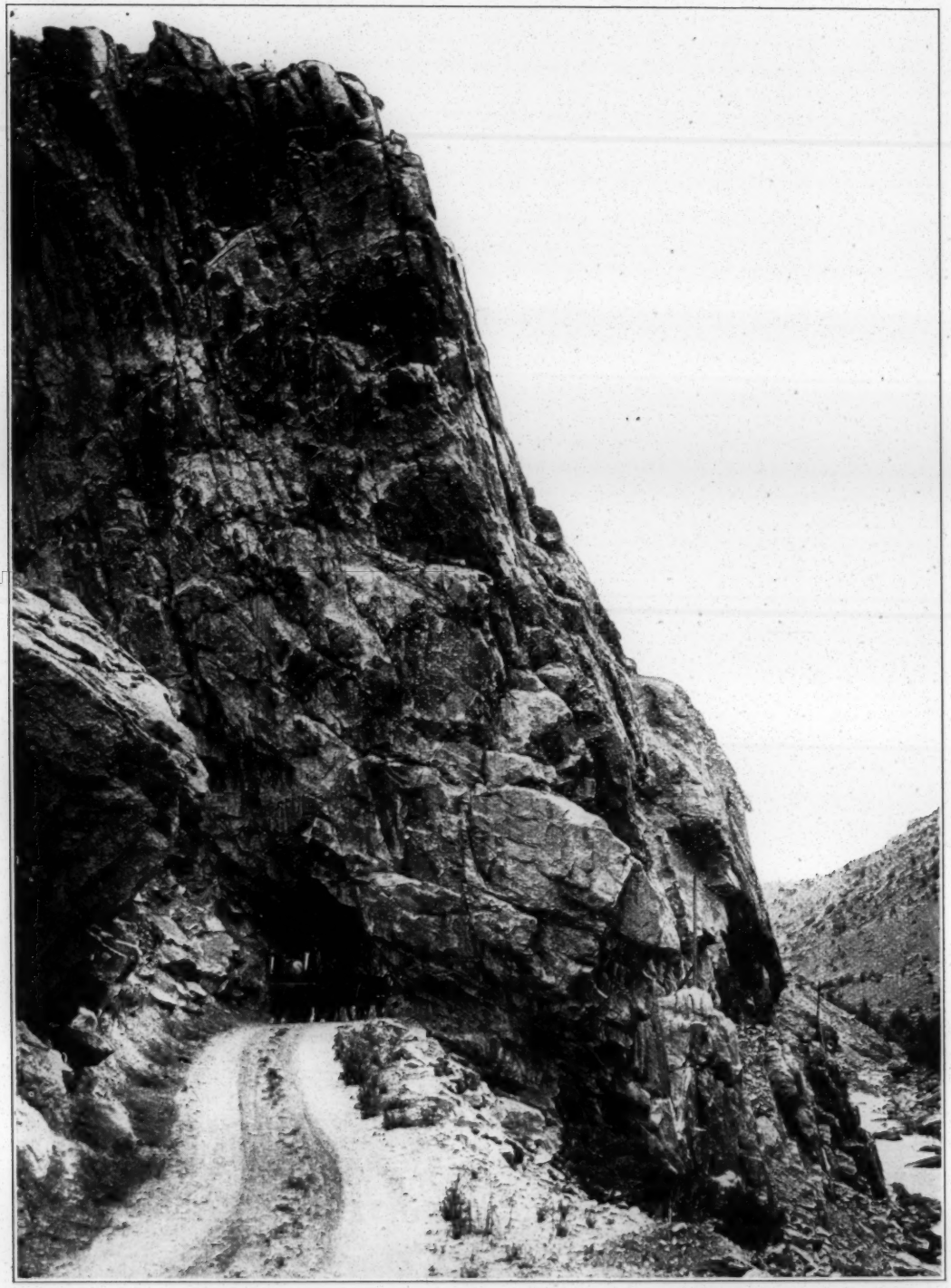
A summation of the work of the Reclamation Service for the three years in which it has been organized shows that it has built 77 miles of main canals, some of them having the size of rivers; 54 miles of distributing canals, and 186 miles of ditches. It has constructed and has in operation 150 miles of telephone, 125 miles of roads in canyons involving deep cuts. It has excavated 10,000,000 cubic yards of material and 3½ miles of tunnels. Work is now actually going on in 13 different projects.

The reclamation fund at this time available for investment by the Secretary of the Interior in feasible irrigation projects is more than $28,000,000. The estimated increment to the fund from the sales of public lands in 1906, 1907, and 1908 is $9,000,000, bringing the total fund up to $37,000,000. Nearly all of this has been apportioned by the Secretary for the construction of the 24 projects mentioned and for which plans have materialized. This practically brings to an end further surveys and examinations and provides for the concentration of efforts of the Service on the actual construction of the works.

Conservative engineers estimate that the reclaimable area of the Great American Desert is 50,000,000 acres. Assuming the average cost per acre of irrigation to be $30, the reclamation of this area will involve the expenditure of $1,500,000,000, or seven times the cost of the Panama Canal.

Some of the reclaimed land has a value of more than $1,000 per acre. The average value of irrigated land in the United States, according to the last census, is $47 per acre; so that the reclamation of this vast empire in the West will result in an increase in the taxable property of the people of $2,350,000,000. It will provide homes for 600,000 families on farms.

And out of the desert, now only the haunt of the skulking coyote and the jack-rabbit, fair cities shall rise, and in the midst of islands of emerald the smoke of thousands of industries shall ascend. Every intermontane valley shall boast of its Riverside or its Redlands, communities representative of the highest and fairest type of the homes of home- and honor-loving Americans.



Before the engineers could begin work on the Shoshone Dam in Idaho they had to construct a road up the canyon and several times tunnel through granite mountains, as in the above picture. (See page 90)

In Arizona

# ARIZONA AND NEW MEXICO

EXTRACTS FROM A SPEECH OF HON. B. S. RODEY, FORMERLY DELEGATE OF NEW MEXICO, IN THE HOUSE OF REPRESENTATIVES

IT is said that there are great arid wastes in New Mexico and Arizona. Now, that is true to some extent; but there is not anything so hard to get rid of on the face of this earth as a popular misconception, and there is not a more deep-rooted misconception extant in this nation than the conception that is in the minds of the people of this Congress with reference to Arizona and New Mexico.

There is not a square mile of the surface area of either of those great territories that has not its use for something, either for pasture, for lumber, for coal, for minerals, or for agriculture. The area of New Mexico alone is bigger than the area of the state of New York, all the New England states, and New Jersey combined. We can give up the size of a few ordinary states to the desert and still have a good many others left for the purpose of agriculture.

Most people think we have no resources in those territories. There are not a dozen men within the sound of my voice who know that Arizona has the greatest forest within this nation. The greatest forest of white-pine timber which the continental United States affords exists in Arizona; it runs from its northwest corner down to its southeastern corner. The second greatest forest in this nation is in New Mexico. The greatest coal field in this nation is in New Mexico. The greatest iron deposit in this nation is in New Mexico. Our territory has iron enough to gridiron China with steel rails and coal enough to smelt it; and yet we are told by gentlemen that we can never support a great population, and that unless we have vast agricultural resources we can never have people. The city of New York alone has more people than each of three-fourths of the states of this Union and it does not produce a potato. The state of Pennsylvania does not raise enough farm products to support its 6,000,000 splendid people.

Is there nothing but agriculture that will support a population? I deny but what we have sufficient agriculture for that purpose, and we will have a great deal more when our waters are impounded, as they will be under the beneficent reclamation act, which was the greatest law in my estimation since the homestead act itself; and when, under the provisions of that act, New Mexico and Arizona shall have their available waters impounded—the flood waters—that now go down, unused, to the sea, they will have an area of cultivation amounting to at least 20,000,000 acres, and that will be equal to 80,000,000, or a tract almost as big as New Mexico itself, because when once irrigated, one acre of our lands is equal to four of any other land in non-irrigated sections.

Do you think that with all these resources we will not support a population? Look at the city of Denver. Twenty-five years ago gentlemen who are now objecting to us would have said that no such city as that could ever come into being in a place like that. It has no more agricultural resources, as the gentleman from Colorado will confess, than we have, and yet there is there today a city of 150,000 or 200,000 people.

New Mexico grazing lands now support seven millions of sheep, a million and a half of cattle, hundreds of thousands of horses, and a vast number of Angora goats. She shipped last year 200,000 head of cattle, 30,000,000 pounds of wool, a vast number of sheep and lambs, and a million and a half tons of

bituminous coal. She shipped since the census was taken $5,000,000 worth of dressed lumber, some of it even as far east as New York city. Since the census was taken in New Mexico we have built 1,200 miles of railroad and equipped it, and it is in operation, a distance equal to that between New York and Omaha. We added 170 new post-offices to our list since the census was taken, and yet you think we are not progressing and that we are stagnant and all that sort of thing.

The present population of the territory of New Mexico is not less than 350,000 people; it has a larger population than any territory ever admitted to the Union as a state, and surpasses in population the following eight states already in the Union: Delaware, Idaho, Montana, Nevada, North Dakota, Utah, Vermont, and Wyoming.

Our population is made up about as follows: Three-fifths of it are people from the states and their descendants, making about 210,000 in number; the other two-fifths of it are native American citizens of New Mexico of Spanish descent, amounting to about 140,000 in number.

Twin Towers of the Cliff Dwellers in New Mexico

If New Mexico and Arizona are joined together, the new state, in addition to being second in the Union in area, will, as to population, in addition to the above, equal or surpass the states of Colorado, Florida, New Hampshire, Oregon, Rhode Island, and Washington.

It has been a state without a government for 58 years.

# BIG OKLAHOMA

EXTRACTS FROM A SPEECH OF HON. BIRD S. MCGUIRE, OF OKLAHOMA, IN THE HOUSE OF REPRESENTATIVES

IN order that this House may have some understanding of our population, I desire to submit the vote of Oklahoma in connection with some other states at the last presidential election. I am advised that the Republican poll of the voting population of Oklahoma, as well as the Democratic poll, at the last election showed that there were about 137,000 voters in Oklahoma, and at that election, outside of county officers, there was no one for whom a vote could be cast other than a delegate. There was not the incentive to draw the people to the polls that there was in the states, where the presidential campaign was on; and at that election Oklahoma cast 110,000 votes, and the following states cast a less number: *

| | |
|---|---|
| Alabama | 108,845 |
| Delaware | 42,873 |
| Florida | 39,302 |
| Idaho | 72,578 |
| Louisiana | 53,908 |
| Maine | 96,027 |
| Mississippi | 58,383 |
| Montana | 64,444 |
| Nevada | 36,154 |
| New Hampshire | 90,089 |
| North Dakota | 70,175 |
| Oregon | 90,184 |
| Rhode Island | 68,856 |
| South Carolina | 56,912 |
| South Dakota | 101,995 |
| Utah | 101,624 |
| Vermont | 51,885 |
| Wyoming | 30,655 |

It will be observed that eighteen states cast a less number of votes than Oklahoma alone. Adding the vote of the Indian Territory to the vote of Oklahoma at that election would have easily reached the figure of 250,000 legal voters. The additional states of the Union which cast a less number of votes than 250,000 are:

| | |
|---|---|
| Arkansas | 116,411 |
| Connecticut | 191,116 |
| Georgia | 138,198 |
| North Carolina | 207,867 |
| Virginia | 130,540 |
| Washington | 128,713 |
| Nebraska | 224,708 |

There are a few others, which I do not recall at this time; but there were thirty-two states which cast less than 250,000 votes and less than would have been the combined vote of Oklahoma and the Indian Territory at that time, and very much less than would be their combined vote of today.

### IMMENSE BUSINESS OF TERRITORY

Oklahoma exported in the last year 13,920 carloads of wheat, 8,023 carloads of flour, 2,368 carloads of feed-stuff, 4,587 carloads of grain, 3,204 carloads of cattle, and 422,092 bales of cotton.

Conceding that the exports of the Indian Territory were as heavy as those of Oklahoma, to move them would require a train reaching from Washington to New York, New York to Chicago, Chicago to St Louis, and from St Louis to Washington.

Oklahoma has 345 newspapers, of which there are 30 dailies, 287 weeklies, 5 semi-monthlies, 19 monthlies, and four quarterlies. The Indian Territory has 142 newspapers, of which there are 19 dailies, 117 weeklies, and two semi-monthlies, the total number of newspapers published in the two territories being 487.

There are in Oklahoma 257 territorial banks and 95 national banks; in the Indian Territory, 144 individual banks and 118 national banks—more than has the great state of Missouri, and more, in fact, than have nine-tenths of the states of the Union.

Out of 86,908 families in 1900, 60,086 owned their own homes, 50,483 of these

* New Mexico cast 43,011 votes for territorial delegate in 1904, and Arizona 19,667 votes.

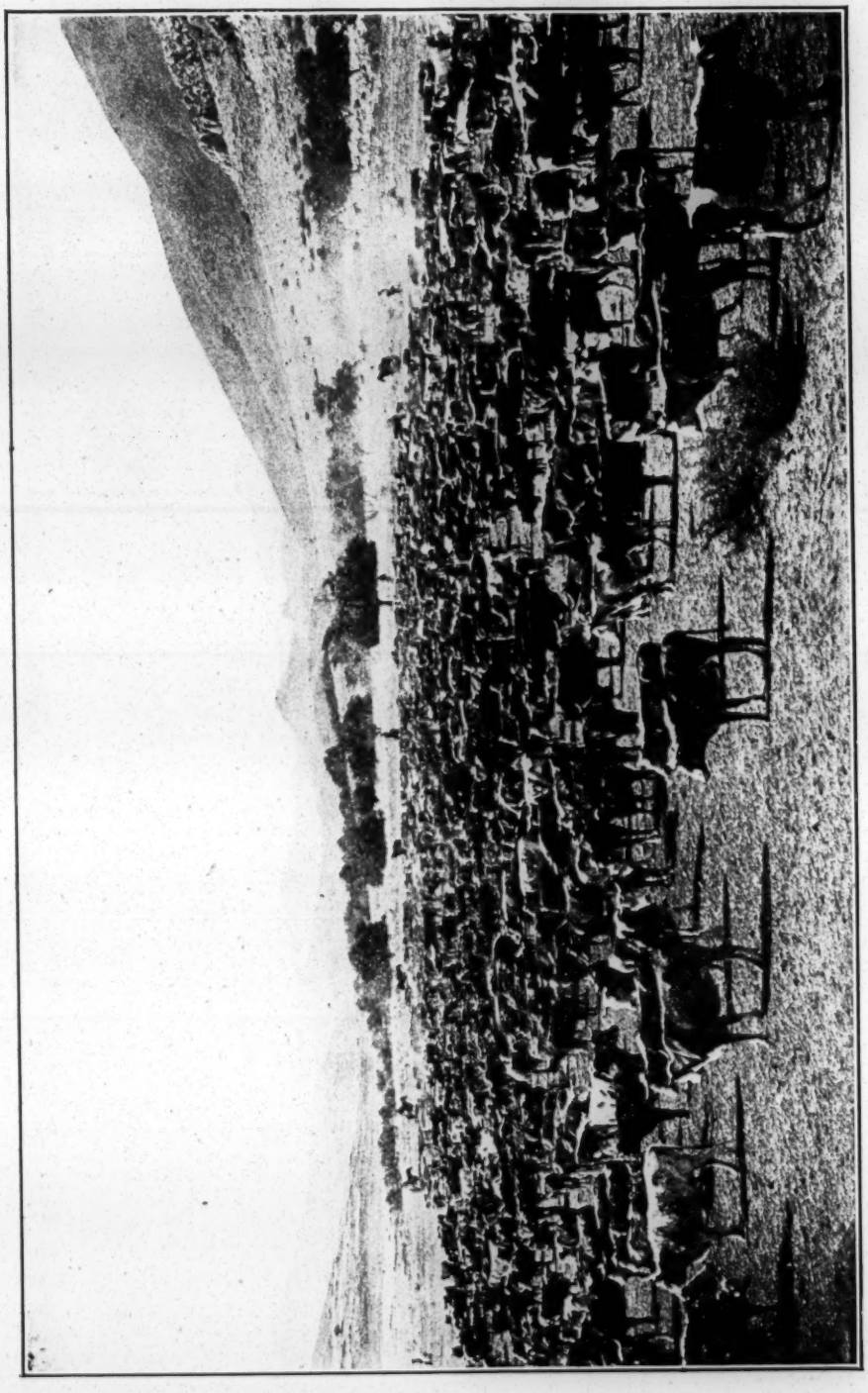


Photo from H. C. Hooker, Department of Agriculture

A Round-up on the Sierra Bonita Ranch, Willcox, Arizona

being without mortgages or incumbrances of any kind. The percentage of families owning their own homes is greater than any state in the Union except three, and the percentage of homes free from debt is greater than any state in the Union.

Thirty-one states have a greater amount of illiteracy than Oklahoma. The percentage of illiteracy among the males of voting age is exactly 5.9, exactly the same as the state of New York. It is less than Massachusetts, Pennsylvania, or the District of Columbia.

Manufacturing is only beginning to develop. In 1905, 637 factories had capital employed $11,074,267 and an output of $16,433,430 and 3,492 wage-earners.

Oil fields are rich, one field alone producing 11,000 barrels per day and 50,000,000 feet of gas per day.

Shawnee, Oklahoma, is the largest potato-shipping point in the United States, 5,000 cars last season bringing in $100,000 clear profit.

The two territories have 6,000 miles of railroad, and within the last six years one-third of the railroads built in the United States was in those territories.

In behalf of 2,000,000 people I earnestly advocate the passage of this bill (the statehood bill).

# THE ISLE OF PINES

THE Isle of Pines, also called Reina Amalia, lies in a deep bight off the south coast of the western part of Cuba. Its area is 986 square miles, or 631,040 acres, but 99 square miles less than the land superfices of the state of Rhode Island. The greatest length is from northeast to southwest, 43 miles, and breadth at the center from east to west 32 miles, and in the south 43 miles.

The island has a geological relation to the general chain of insular mainlands of the Antilles, and is unlike the numerous low coral and sand formations known as keys and mangrove swamps scattered in such profusion off the coast. In general the surface is a plateau from 50 to 100 feet above sea-level, broken by ridges of hills or cliffs that project abruptly above the general surface.

The two mountain ridges at the northern end reach an elevation of about 1,500 feet and are composed of limestone and marble. The other ridges in the center are much lower, less precipitous, and formed of gray sandstone, red rock, and gravel containing iron.

The whole island, with the exception of the rocky southern coast, is surrounded by mangrove swamps, with here and there a stretch of sandy beach.

The island has a number of rivers of excellent water, the most important of which, emptying on the north coast, is the Nuevas, composed of several mountain tributaries 5 to 10 feet deep and navigable 4 or 5 miles.

### THE MINERAL SPRINGS

The mineral springs, for which the island has a world-wide reputation, judged from official and individual certification as to curative properties and results of the waters, are remarkable, especially in pulmonary, rheumatic, and throat affections.

A chemical analysis shows the waters to be impregnated with oxygen and carbonic acid gases, chloride of sodium, sulphate of lime, carbonate of lime, iron, magnesia, chloride of calcium, nitrate of lime, silex, and extractic organic matter. Temperature of water, 82 degrees F. The regimen of treatment is two baths of a quarter of an hour each and four glasses, taken inwardly, per day. The baths are erected over the springs. The testimonials of the beneficial effects of bathing and drinking are numerous,

From J. O. La Gorce

One of the Streams of the Isle of Pines

among others being a case of bronchial trouble requiring caustic treatment of the throat which was cured in ten days and without a recurrence of the complaint. It is claimed that the waters rival Saratoga in the United States.

From J. O. La Gorce

A Spanish Laurel, 110 Feet in Width, Isle of Pines

THE CLIMATE EXCELLENT

The climate is described as "delicious, the air pure and balmy, and, notwithstanding the island being surrounded by water, is considered dry. The winds coming from the sea and passing over the pine forests are gentle and invigorating." The year is divided into two seasons. During the wet season, or summer, the rains begin early in June and last until October, seldom more than two hours in the afternoon, and are accompanied by thunder and lightning. The greatest rainfall is in May, June, and July, although there is no month entirely free from rain. During this wet season about two-thirds of the precipitation of the year is received. The day is usually clear until 10 a. m., after which it is showery until night. The nights are clear. The hottest hours are from 10 to 12 a. m. About 2.30 p. m. the breeze blowing in from the sea moderates the temperature. At night the copious dews contribute to the luxuriance of vegetation.

The dry season, or winter, extends from October to June, with occasional visitations from November to February of cold winds blowing from the north lasting about 48 hours, when the temperature falls to fifty, but is not as uncomfortable as the March winds in the States. This season is not entirely without precipitation, the days of rain numbering about one-third of the wet season. The annual rainfall ranges from 50 to 52 inches, or less than on the Gulf coast of

the States. The average rainy days are ten in the month, and the average humidity for the year 75 per cent.

The annual temperature of Habana, less than ninety miles in a straight line north, is mean maximum, 82½ degrees to 84 degrees F.; mean minimum, 71 degrees. The highest temperature on record is 100.6 degrees and lowest 49.6 degrees. The mean annual temperature is 75 degrees. The heat is oppressive on account of the moisture. The prevailing winds of the Isle of Pines are the northeast trades, which blow with but little variation throughout the year, rendering the nights cool both in winter and summer. The range of temperature between summer and winter rarely exceeds a mean of 11 degrees.

POSSIBILITIES OF DEVELOPMENT

Dr C. Willard Hayes, of the U. S. Geological Survey, says of the island:

"Considered from the economic viewpoint, the Isle of Pines is scarcely to be compared with Cuba. Its soil is not adapted for sugar raising, though certain parts are probably as well adapted to tobacco culture as the famous Vuelta Abajo district. Much of the island would doubtless produce fruits, as well as cacao, which latter is one of the most profitable crops grown in the tropics. The industry for which the island appears pre-eminently fitted is grazing, and it will doubtless in time become an important source of supply for cattle and sheep for the West Indian markets.

"It is also destined to become an important health resort, and all conditions of climate, vegetation, and scenery combine to render it attractive both to invalids and others who wish to escape the severe northern winters.

"The mineral resources so far as at present known are confined to marble, but of this there is an unlimited amount of different grades, suitable for a great variety of purposes. It is possible that iron and manganese may both be discovered on the island in commercial quantities.

"Unfortunately the island is without deep harbors, which largely neutralizes its value from a military standpoint."

There are about 1,000 people on the island, mostly Spanish and colored. In the last several years a large colony of Americans has grown up. The island belongs to Cuba.

## THE PEOPLE OF MOROCCO

"THE population of Morocco has been variously estimated at from so trivial a number as four million up to seventy million, but as none of our authors who have made these statements have been able to base their reports upon any census, it is the vaguest kind of guesswork," said Mr Ion Perdicaris in a recent address to the National Geographic Society (to be published in an early number of this magazine). "The country gives to strangers who do not know it the impression of being very sparsely populated because the natives avoid the neighborhood of the highroads. This is due to the continual passage of troops and because the inhabitants are also subjected to what is called the system of supplying 'moona,' a system which enables travelers to procure letters from the government; and these letters entail upon the inhabitants of the roads the necessity of supplying food, not only for the travelers themselves, but for all their escorts. It is a very serious tax, and the natural consequence is that the inhabitants avoid the neighborhood of the highroads as much as possible. Therefore the travelers going back and forward see very few inhabitants in the very few villages that still remain. But the people who know the country better—the merchant and others who travel in the country itself—realize very soon that it is very much more densely occupied than would appear from the highways."

From stereograph copyright 1906 by Underwood & Underwood, New York

The Sultan of Morocco in the Uniform of a Zouave

Owing to the prejudice of his subjects against foreigners, no one except the Europeans at the Court saw him in this costume. The photograph was taken in his own private studio at Fez

## PROGRESS IN SURVEYING THE UNITED STATES

MR O. H. TITTMANN, Superintendent of the U. S. Coast and Geodetic Survey, in his official report for 1905, gives the following interesting summary of the year's work: "The most notable feature of the work of the year is the completion of the line of precise levels connecting the Atlantic Ocean and the Gulf of Mexico with the Pacific Ocean. The three principal connections with sea level are at Sandy Hook, New Jersey; at Biloxi, Mississippi, and at Seattle, Washington. The distance between Sandy Hook and Seattle along the shortest line of leveling of the highest degree of accuracy is 7,400 kilometers, and the similar distance between Biloxi and Seattle is 5,700 kilometers. This leveling is a portion of the precise-leveling operations which will eventually furnish standard elevations in the United States, upon which the extensive operations of the Reclamation Service can be based and for use of geographers, civil engineers, and surveyors, and for physical investigations relating to the planet on which we live. The leveling operations have been thoroughly checked by closed circuits as far west as Norfolk, Nebraska, and the closure of the line westward on mean sea level at Seattle, a distance of 3,300 kilometers, with a small discrepancy which

From U. S. Coast and Geodetic Survey

Coast Survey Party Loading Outfit into Canoes, 1¼ Miles from Shore, Yukon Delta Coast, Alaska

The bed of the ocean is so little inclined that each succeeding tide floods an area of many hundreds of square miles. With the ebb this vast expanse is completely drained, and then presents to the eye an unbroken surface of mud and offers the traveler a most uninviting and difficult footway.

is within the allowable limits of error in levels extending over this distance, is most satisfactory.

"Work on the opening and remonumenting of the international boundary between the United States and Canada west of the Rocky Mountains is making satisfactory progress under my direction and that of the Director of the United States Geological Survey, as commissioners on the part of the United States.

"The demands of the navy for assurance that no undiscovered dangers to navigation existed in certain waters was met by the construction of a wire drag 1,000 feet long, and a method was devised by which this drag, set to any desired depth, can be pulled through the water over all portions of any bay or harbor. The drag catches and immediately reveals any hidden rock or any danger to navigation. This drag was successfully used in Frenchmans Bay on the coast of Maine.

"In response to a request from the Isthmian Canal Commission, a survey was made of the Bay of Limon and approaches to Colon, in the Canal Zone.

"The triangulation was extended from Mount Shasta, in California, to Eugene, Oregon; in Minnesota, from the North Dakota line to Aitkin; in Texas, from Floresville to Alice, and was in progress in Minnesota and in Washington, north of the Columbia River, at the close of the year. The progress along the ninety-eighth meridian was more rapid and at less cost than during any previous year.

"A continuous record of the variations in terrestrial magnetism was obtained during the year by photographic means at the magnetic observatories at Cheltenham, Maryland, at Baldwin, Kansas, at Vieques, Porto Rico, at Sitka, Alaska, and at Honolulu, Hawaii. Incidentally meteorological and seismological observations were made at these observatories.

MAGNETIC STORMS

"The year was notable by the large number of magnetic storms which sensibly affected the compass direction, this being the period of maximum sun-spot activity. On the average there have occurred two such storms monthly, which deflected the compass by one-quarter of a degree and more. A comparatively large number of earthquake records were also obtained during the year, the most notable one being the Indian earthquake of last April.

"The magnetic survey of the country was extended by making observations at numerous stations (286) with portable instruments in 41 states and territories. Some magnetic observations were also obtained in the West Indies during the voyages of the Coast and Geodetic steamers *Bache* and *Explorer* to the Canal Zone and Porto Rico.

"Valuable results for the improvement and correction of the magnetic charts of the Atlantic Ocean were obtained on the cruises of the Coast and Geodetic Survey steamers *Blake* and *Bache* from Baltimore to the Maine coast last summer; also by the *Explorer* on her cruise to Porto Rico and back, and by the *Bache* on her trip to the Canal Zone.

"Similar results for the Pacific Ocean were obtained by the Coast and Geodetic Survey steamers *Patterson* and *Gedney* on their respective cruises. In all, magnetic data were obtained at about 50 different points in the Atlantic and Pacific oceans.

"In this connection mention should also be made of the effective coöperation entered into between the Survey and the Carnegie Institution of Washington, and it is expected that most valuable data will be obtained in the Pacific Ocean. This institution has taken up the systematic magnetic survey of the Pacific Ocean. It has chartered a vessel for this purpose and placed it under the command of one of the most experienced officers of the Survey.

ALASKA

"In Alaska the survey of Iphegenia Bay, Davidson Inlet, and Sea Otter Sound was continued. A survey was

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Courtesy of Popular Science Monthly

Map of Alaska, Showing Unexplored Areas in 1905

made of Kiska Harbor at the request of the Navy Department. Surveys were also made in Resurrection Bay and in Prince William Sound. A hydrographic examination was made of the waters between Prince William Sound and Resurrection Bay at the request of the War Department, to facilitate the laying of a cable by the Signal Corps. The longitude of Sitka was determined from Seattle by the telegraphic method, and the work of determining the longitude of other points by the same method was in progress at the close of the year."

In the Philippines the charting of the coasts and harbors has advanced very rapidly.

## HOW MUCH IS KNOWN OF ALASKA

MR ALFRED H. BROOKS, who has charge of the Alaskan explorations of the U. S. Geological Survey, gives the following summary of what is known of Alaska in the Popular Science Monthly for January:*

| | |
|---|---|
| Explorations by U. S. Geological Survey | 80,000 |
| Geologic and topographic reconnaissance surveys | 60,000 |
| Explorations by other departments | 50,000 |
| Coastal province, shore line surveyed by Coast Survey and some geological surveys made by Geological Survey | 120,000 |
| Unmapped and practically unexplored | 310,000 |
| Total area of Alaska | 620,000 |

Besides this, about one thousand square miles have been surveyed in great detail The above statement does not include the extensive special investigations of mineral resources which have been made, for which about 20 per cent of the total appropriations have been used.

It is difficult now to realize how little

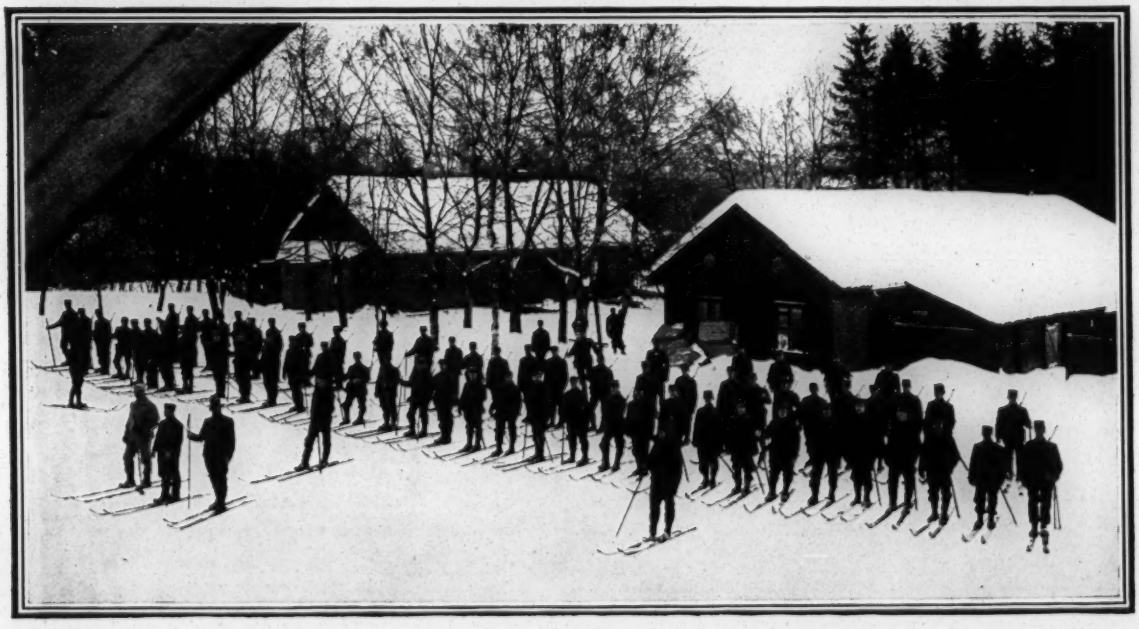
*See contour map of Alaska published by the National Geographic Society.

was known of Alaska previous to 1896. The general courses of the larger drainage features were laid down on maps, but only in a very crude way. The coastal mountains were known, but the two great inland ranges, one of which contains the highest peaks on the continent, were hardly indicated on any map. Only a few of the passes were known, and the altitude of not a single point away from the coast had been established. Now all but two of the larger rivers have been surveyed, and contour maps have been made of over 150,000 square miles. All of the larger geographic features have been outlined by the network of explorations which have been extended over the entire territory. There are no new mountain ranges to be discovered, though there are several which are but imperfectly known.

In the purely geologic work the results are still more striking. While a decade ago only a few facts about the geology of the coast province were known, it has been possible now to prepare a preliminary map of the geologic features of over half the territory. The stratigraphic studies are of still greater interest, for they have shown the presence of many horizons in northwestern America that were previously unsuspected.

There is not a single mining district in Alaska which has not been reported upon. An inquiry in regard to the mineral resources of any part of Alaska coming to the office of the Survey is now met with a printed report containing the latest and most authentic information.

While much has been accomplished, much remains to be done. Over half the territory has not been covered by even reconnaissance maps. Even these will not suffice in regions of important mineral production, where often hundreds of thousands of dollars are being invested, and detailed surveys, comparable to those made in the states, are demanded.



Courtesy of Review of Reviews, Copyrighted

A Company of Norwegian Soldiers, Mounted on Their Ski, Ready for a Long March into the Icy Wilderness

In its relation to the federal government, Alaska differs from any other possession of the United States. Though heavily taxed, the 30,000 white residents have no voice in the making of their laws. Porto Ricans and Hawaiians have territorial government, the Filipinos have their commission, but Alaska must depend entirely on the benevolent paternalism of a legislative body 5,000 miles away.

## A DICTIONARY OF UNIVERSAL GEOGRAPHY*

EIGHTY thousand places are listed and described in the new edition of Lippincott's Gazetteer, edited by Messrs Angelo Heilprin and Louis Heilprin and just published by J. B. Lippincott Co. The descriptions vary from one line to several pages. For condensed, accurate, and useful information as to the geography, geology, history, commercial condition, etc., of the world, this Gazetteer has no equal. The publishers have used a light but tough paper, so that in spite of the immense amount of matter included, the volume is easily handled.

Lippincott's Pronouncing Gazetteer, in its various editions, has been before the public just half a century, the first edition having made its appearance in 1855. The present publication, printed from new type from cover to cover, is a new work, embodying little more than the framework of its predecessor, together with its system of pronunciation. It presents a picture of the world in its minutest details in the year 1905.

For the United States a standard of inclusion has been adopted entirely different from that employed in the case of foreign countries. Almost every cluster of houses that in this country deserves the name of hamlet is supposed to figure in the pages of the Gazetteer. The Philippine Islands and other possessions of the United States beyond the seas are dealt with under a vast number of heads. For Canada the standard of inclusion has been made almost the same as that of the United States, and this is also true of Cuba, Mexico, the South American republics, and the South African colonies.

The political and commercial changes in the last ten years have been incorporated, and also the latest results in polar work, in mountaineering, etc.

"No survey of the field would be adequate without a reference to the changes that have taken place during the recent years in the sources of the mineral supply of the world. The auriferous fields of the Transvaal Colony have developed into the richest on the face of the globe. Colorado has outstripped California in the yield of gold, and has become the foremost silver-producing state in the Union. Montana now boasts of the richest deposits of copper in the world, and Minnesota outranks Michigan in the output of iron. The product of the iron mines of Germany has eclipsed that of the mines of Great Britain. Sweden has risen to a new level among the iron-producing countries through the exploitation of the prodigious deposits of Gellivare, beyond the Arctic Circle. New Caledonia has found a rival in the district of Sudbury, Ontario, as a leading source of the world's supply of nickel. Immense stores of petroleum have been discovered in California, Texas, Kansas, and adjacent regions, vying with those of the Appalachian fields and the Ohio Valley. In the yield of this mineral Baku, on the shores of the Caspian Sea, has risen to the foremost position in the world. Prussia almost equals England in the products of its coal mines."

*Lippincott's New Gazetteer, A Complete Pronouncing Gazetteer or Geographical Dictionary of the World, containing the most recent and authentic information respecting the countries, cities, towns, resorts, islands, rivers, mountains, seas, lakes, etc., in every portion of the globe. Edited by Angelo Heilprin, of the Sheffield Scientific School of Yale University, late President of the Geographical Society of Philadelphia, Fellow of the Royal Geographical Society of London, etc., and Louis Heilprin, author of "The Historical Reference Book," etc. 2050 pp. 11 by 8 inches. Philadelphia and London: J. B. Lippincott Company, 1906. $10.00.

# CORRESPONDENCE

ERRATUM

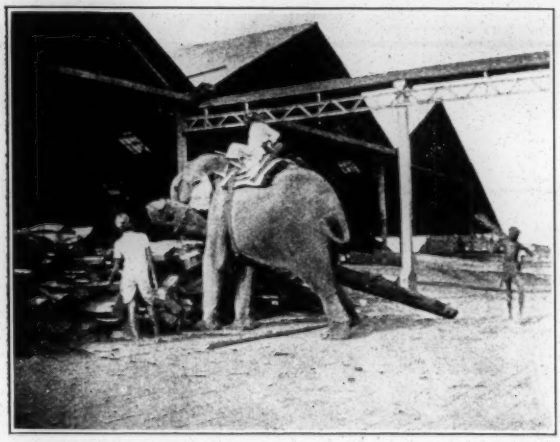
Through an error in proof-reading the statement was made on page 51 of the January number that the new Salton Sea of California covered an area "800 miles square" instead of "800 square miles."

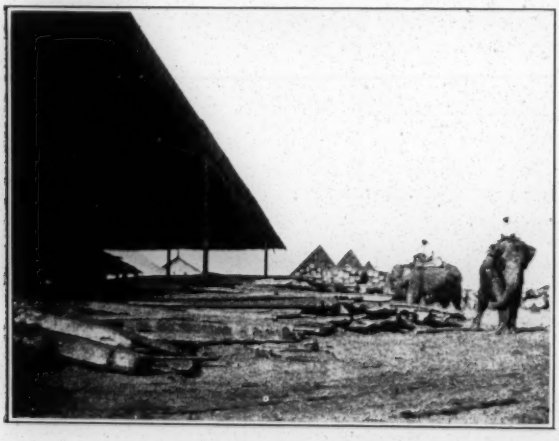
PHILADELPHIA, *January 25, 1906.*

*Editors National Geographic Magazine:*

The photographs sent you were taken by me during a recent trip around the world. One and two illustrate industrial conditions in Rangoon, Burma, showing how elephants are employed in saw-mills to do the work which in more progressive countries is accomplished by steam. The third represents a native boy orchestra in Garoet, Java. The musical instruments are of bamboo cut in unequal lengths so as to form a sort of octave, and after being hollowed out the tubes are attached loosely together with thin strips of wood, so that when gently or forcibly shaken very agreeable music is produced. The instrument is called an Antlung.

Yours truly, EMILY BELL.

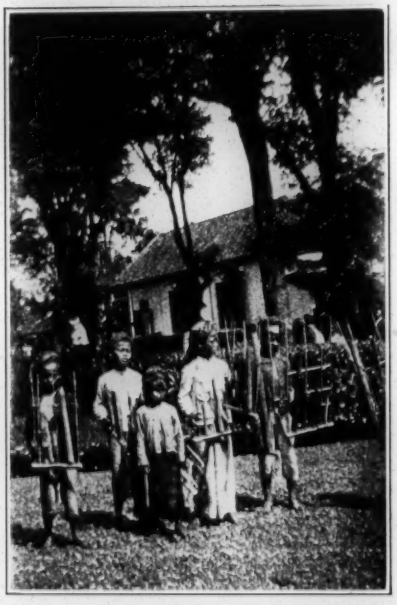




MOUNT VERNON, N. Y., *January 18, 1906.*

*Editors National Geographic Magazine:*

Replying to a query conventionally signed X. Y. Z., concerning Lower California, will you allow me to add to your reply the opinion that it is an excellent place to keep away from, if one is looking for business. There is scarcely a feature about the peninsula, from north to south, that is attractive to a white man. Along the coast plain, which is much interrupted by cliffs, there are but few localities in which the land could be made productive without a great expenditure of money and labor. The made lands in the vicinity of the mouth of the Colorado are productive where irrigation is possible, but the intense heat of summer unfits the region for any but people of tropical latitudes. The Pacific Coast region is more temperate in climate, but the area of productive land is very small. There are a few calling places for vessels—all small villages, inhabited mainly by half-breeds—but none is of importance. Tia Juana (Aunt Jane) is not far from National City and



Photos by Emily Bell, Philadelphia

San Diego, California. On the whole, it is a rather hot place; but then it is "just over the border." A trail, which in some places has been made a fair cart road, extends from Tia Juana along the whole extent of the peninsula to La Paz, the most important village, and thence to Lower San José. A Mexican colony might settle at various places on the peninsula and prosper fairly at fruit farming, but it is doubtful if a single location exists where an American colony could do anything but starve. Some of the mesa lands have an elevation of 4,000 feet. As a rule, they furnish fair grazing.

J. W. REDWAY.

# NATIONAL GEOGRAPHIC SOCIETY

### Popular Meetings

National Rifles Armory, 920 G street, N. W., 8 p. m.

**Friday, February 2**—"The Greek Monasteries at Mt Athos and the Greek Church." Illustrated. Dr Edwin A. Grosvenor, professor of international law in Amherst College. The Mt Athos monasteries were founded 1,500 years ago. Ten thousand monks live there now. No woman nor any female creature—not even a cow or a pussy cat—has set foot within the grounds during 1,500 years.

**Saturday, February 10**—"A Flamingo City and Bird Life in the Barbados." Illustrated. Dr Frank M. Chapman, American Museum of Natural History.

**Friday, February 16**—"Africa from Sea to Center." Illustrated. Mr Herbert L. Bridgman. Africa in transition today challenges the attention of the world. Few intelligent Americans know to what extent its possibilities have been developed since Livingstone's day, a development that in rapidity promises to exceed that of North America.

**Saturday, February 17, at Hubbard Memorial Hall**—"Across South America." Illustrated. Mr Alvah D. James.

**Tuesday February 20**—"My Captivity in Morocco." Illustrated. Mr Ion Perdicaris.

**Friday February 23**—"The Personal Washington." Illustrated. Mr W. W. Ellsworth of the Century Company. This is not a lecture in the ordinary sense of the word, but it is an exhibition through the medium of the stereopticon of the greatest collection of prints, manuscripts, and letters referring to the personal side of Washington ever brought together.

**Friday, March 2**—"Our Immigrants: Where They Come from, What They Are, and What They do After They Get Here." Illustrated. Hon. F. P. Sargent, Commissioner General of Immigration.

**Thursday, March 8**—"The Russian Peasant." By Frank G. Carpenter. Illustrated.

**Friday, March 16**—"Oriental Markets and Market Places." By Hon. O. P. Austin, Chief U. S. Bureau of Statistics. Illustrated.

**Friday, March 30**—"The Total Eclipse of the Sun, July, 1905, as observed in Spain." By Rear Admiral Colby M. Chester, U. S. N., Superintendent U. S. Naval Observatory.

**Tuesday, April 13**—It is hoped that official business will permit the Secretary of the Navy, Hon. Charles J. Bonaparte, to address the Society on "The American Navy."

### Scientific Meetings

Hubbard Memorial Hall, 8 p. m.

**Friday, February 9**—"The Introduction of Foreign Plants." By Mr David G. Fairchild, Agricultural Explorer, U. S. Department of Agriculture.

**Friday, March 9**—"The United States Bureau of the Census." By Hon. S. N. D. North, Director, Bureau of the Census.

**Friday, March 23**—"The Death Valley." By Mr Robert H. Chapman, U. S. Geological Survey.

**Friday, April 6**—"Hunting with the Camera." By Hon. George Shiras, Member of Congress from the third district of Pennsylvania.

**Friday, April 20**—"The Protection of the United States Against Invasion by Disease." By Dr Walter Wyman, Surgeon General Marine Hospital Service.

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